

NETWORK WORLD

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API to boost SNMP agent capabilities

By Maureen Molloy
Senior Writer

WASHINGTON, D.C. — SNMP Research, Inc. last week announced an API to a new "master" SNMP agent that will enable a central management station to control multiple components within a single network node.

The application program interface (API) will ease the task of managing devices such as workstations and hubs that are composed of products from a number of vendors. Today, Simple Network Management Protocol management stations can only recognize a single agent on any given device.

At INTEROP 92 Spring here, eight vendors, including Sun Microsystems, Inc.'s SunConnect unit, Data General Corp. and SynOptics Communications, Inc., announced plans to incorporate the API into their respective management platforms, peripherals and applications.

The new API, dubbed the Enhanced Management Agent Through Extensions (EMATE), defines how one master
(continued on page 50)



National Car Rental CIO Jack Livingston lands ICA/Network World Call for Innovation award. See story, page 6.

Forum charts course for the future of frame relay

By Bob Wallace
Senior Editor

WASHINGTON, D.C. — The Frame Relay Forum last week detailed enhancements it is working on that are designed to make frame relay more attractive to a wider user base.

The forum is working on specifications for multiprotocol encapsulation, as well as T-3 access ports and trunk speeds. It is

also trying to get frame relay included in the Government Open Systems Interconnection Profile (GOSIP) and is examining test options that would enable users to determine whether products are frame relay-compliant.

"We're doing everything we can to enhance frame relay and make it more attractive for a larger user audience," said Rajiv Ka-
(continued on page 6)

IBM rollout plunges firm into FDDI fray

Big Blue intros FDDI concentrator, PC adapters, management wares; adds FDDI to 6611 router.

By Caryn Gillooly
Senior Editor

WASHINGTON, D.C. — IBM last week dove headfirst into the FDDI market with the release at INTEROP 92 Spring here of FDDI products supporting both fiber and shielded twisted-pair cabling.

As expected, IBM introduced a Fiber Distributed Data Interface concentrator, microcomputer FDDI adapters and management products. Big Blue also said it would add FDDI support to its router.

"This is a major step toward fulfilling commitments IBM made in its networking blueprint of March 25," said Dennis Kekes, director of LAN networking products at IBM's Networking Systems division in Research Triangle Park, N.C. That announcement focused on mainframe support of Advanced Peer-to-Peer Networking but also touched on high-speed local-area network technologies ("IBM maps out SNA strategy for the '90s," NW, March 30).

Heading up the product roll-

out was IBM's new 8240 FDDI Concentrator. The 8240 chassis can support as many as six four-port attachment modules or a maximum of 24 devices, such as
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FEATURES



Frame Relay Test Series raises router interoperability questions. Page 35.

Users see ups and downs of wireless LAN

By Ellen Messmer
Washington Correspondent

DES MOINES, Iowa — While one bank here is reaping the benefits of NCR Corp.'s WaveLAN wireless LAN, another user has been forced to put a network test on hold due to interference problems caused by WaveLAN.

Hawkeye Bank of Des Moines cut loose the local-area network cables and leased lines that once linked its seven offices here and installed WaveLAN, a strategy that has reduced expenses and eased cable management.

But the county of Mecklenburg, N.C., has not been as lucky. It was forced to halt its WaveLAN test when the system was found
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NETLINE



AT&T TO OFFER international version of virtual data network offering. Page 4.

SYBASE NLM VERSION of SQL database server can tap OS/2, Unix or VAX servers. Page 4.

GROUP FORMED TO DEVISE a standard for managing net-attached workstations. Page 4.

SMDS SPEC PROMISES im-

proved management capabilities. Page 4.

IBM ADDS Ethernet, frame relay net management to NetView arsenal. Page 5.

COMPAQ AIRS NET SERVER management strategy. Page 5.

TELCOS TODAY provide a range of options for presenting billing data. Page 32.

IBM set to off-load TCP/IP chores from mainframes

By Michael Cooney
Senior Editor

WASHINGTON, D.C. — Within the next six months, IBM will roll out software that off-loads TCP/IP processing from mainframes to its 3172 Interconnect Controller or RISC System/6000.

Known as "off-load technology," the software will initially reside on a new model of the 3172. It promises to not only save valuable mainframe cycles, but also to provide better performance for Transmission Control Protocol/Internet Protocol users needing access to mainframe-based TCP/IP applications.

IBM said the software may be

ported to the RS/6000 in the future, making it the TCP/IP processor for the mainframe.

"We estimate users will be able to save 30% of their total mainframe cycles by using the off-load technology," said Daniel Barton, a staff programmer with IBM's TCP/IP development branch in Research Triangle Park, N.C. "The 3172 acts as a front-end processor and gets the host out of processing TCP/IP communications."

The company demonstrated the off-load technology software at last week's INTEROP 92 Spring trade show here and said its goal
(continued on page 48)



Nine carriers jointly unveil SMDS, frame relay plans

Local carriers outline their 1993 rollout plans in first-of-its-kind briefing seen at ICA, INTEROP.

By Anita Taff
Washington Bureau Chief

ATLANTA — By the end of 1993, nine of the largest local carriers in the U.S. will offer Switched MultiMegabit Data Service (SMDS) and frame relay service in 43 cities.

In an unprecedented announcement last week, the seven regional Bell holding companies, GTE Telephone Co. and Southern New England Telephone Co. held a joint press briefing outlining their deployment plans for the services. The briefing was carried on a one-way video, two-way audio link between the International

Communications Association annual conference here and the INTEROP 92 conference in Washington, D.C.

Frame relay is a fast packet service that can carry data traffic at speeds up to 1.544M bit/sec and is generally considered to be most appropriate for intracompany communications. SMDS can carry data traffic up to 34M bit/sec. Typical applications for both services include local-area network interconnection, computer-aided design and manufacturing applications, medical imaging and videoconferencing.

(continued on page 50)

New mgmt. platform to support both SNMP, CMIP

DG, Digital Analysis team up for OS/EYE*NODE.

By Maureen Molloy
Senior Writer

WASHINGTON, D.C. — Digital Analysis Corp. (DAC) and Data General Corp. announced at INTEROP 92 Spring last week a network management platform to support both TCP/IP and OSI networks and applications.

Jointly developed by the two companies, the Open Systems (OS)/EYE*NODE runs on any Unix-based machine and enables users to monitor and control Simple Network Management Protocol- or Common Management Information Protocol (CMIP)-based applications or nodes.

In addition to these Transmission Control Protocol/Internet Protocol and Open Systems Interconnect net management standards, the platform will support the evolving Open Software Foundation, Inc.'s Distributed Management Environment.

OS/EYE*NODE, which is equipped with an OSF Motif-based user interface, can be configured with an optional gateway to filter and forward SNMP traps to an IBM NetView enterprise manager over a Systems Network Architecture net.

OS/EYE*NODE works with (continued on page 51)

Novell offers LANtern as NLM, adds RMON support

By Caryn Gillooly
Senior Editor

WASHINGTON, D.C. — Novell, Inc. last week announced at INTEROP 92 Spring here that it has revamped its LANtern net monitoring product by adding support for the SNMP remote monitoring specification and making the previously hardware-based product available in software.

The changes will enable network administrators to capture packets from, as well as monitor, network devices supporting the RMON Management Information Base (MIB). And the new Net-

Ware Loadable Module (NLM)-based version of LANtern supports that capability from within the Novell NetWare server.

"On one hand, we've taken the LANtern functionality and ported it to NetWare," said Duane Murray, vice-president and general manager of Novell's Network Management Products Division in San Jose, Calif. "But we've also added the packet capture and filtering capabilities of RMON. So now all those capabilities are available as a single set of NLMs."

RMON is a Simple Network Management Protocol MIB — (continued on page 50)

Briefs

TRW to offer ATM switch, HIPPI line. TRW, Inc. last week said it plans to unveil two high-performance network product lines later this year. The first is a series of broadband access switches based on the Asynchronous Transfer Mode standard. The second will be a line of High Performance Parallel Interface (HIPPI) extenders and switches aimed at supercomputer users and OEMs of supercomputers, minicomputers and high-end workstations. The HIPPI products will support gigabit-level speeds. The products will be marketed through OEMs, distributors and TRW's direct sales force.

Users call for LECs to file service performance data. The International Communications Association (ICA) and the Consumer Federation of America have asked the Federal Communications Commission to require local exchange carriers that use price caps to include quality standards for service in their annual access tariff filings. In response, the FCC last week opened a rule-making proceeding, asking parties to comment by June 22 on whether tariffed local exchange carrier services should include bit error rate, signal-to-noise ratio, call completion or other service elements suggested by the ICA.

IBM missing from pack backing specification. IBM — unexpectedly — was not among the 20 vendors that last week announced support for a specification intended to let vendors' applications work with a variety of network-based tools that track application usage ("Vendors agree on way to manage program usage," *NW*, May 18). IBM is not supporting the so-called Licensing Service application program interface (API) because it is "not complete," said Tom Dow, IBM systems manager for Personal Systems programming. Specifically, the spec lacks an antitampering mechanism and antitampering guidelines for application developers, Dow said. IBM is looking for standards organizations such as the Open Software Foundation, Inc. (OSF) to provide vendor-neutral licensing facilities. The OSF, ironically, supports the Licensing Service API.

VideoTelecom unveils video mail. VideoTelecom Corp., an Austin, Texas, maker of videoconferencing systems, last week demonstrated at the International Communications Association conference an application, dubbed VideoMail, for its personal computer-based videoconferencing system. The software lets users create, store and send a one-minute video and audio message. VideoMail comes as a standard feature on the vendor's MediaConferencing system and as an option on its new VisionPlus system.

Carrier offers SNA net management service. Cable & Wireless Communications, Inc. last week announced SNA Connect. The service will enable customers to tie Systems Network Architecture sites into Cable & Wireless' network, allowing the carrier to take over end-to-end management of the facilities including equipment maintenance. The service simplifies management of multidrop networks by enabling the carrier to add or delete lines without taking the whole network down.

NTI to purchase cellular system supplier. Northern Telecom, Inc. last week announced it intends to purchase the cellular radio systems division and customer base of Canadian manufacturer NovAtel Communications, Ltd. of Calgary, Alberta, for \$41.9 million. NovAtel is owned by the government of Alberta.

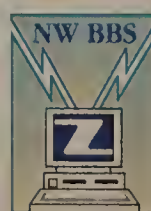
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Int'l users to benefit from new AT&T SDDN service

SDDN-I to closely resemble domestic offering.

By Anita Taff
Washington Bureau Chief

ATLANTA — At the International Communications Association (ICA) show here last week, AT&T said it will roll out in August an international version of its Software-Defined Data Network (SDDN) service, dubbed SDDN-I.

AT&T has offered switched data worldwide since 1989

through its Switched Digital International (SDI) service, but the new SDDN service will be less expensive and eventually offer more features than SDI.

SDDN-I will cost between 5% and 20% less than SDI because SDDN-I data traffic will count toward volume discount levels on



the customer's Software-Defined Network virtual voice service.

Initially, AT&T will offer SDDN-I at 56K or 64K bit/sec. Customers will be able to access the service via Integrated Services Digital Network Primary Rate Interface links, T-1 lines, Dataphone Digital Service or Accunet Digital Service. Users of AT&T's domestic SDN or SDDN services who have

digital access will now use the same access for international calls.

AT&T officials said SDDN-I will be offered in the same 19 countries in which its SDN is currently available. Those countries include Australia, Belgium, Canada, France, Germany, Hong

Kong, Italy, Japan, the Netherlands, Singapore, Sweden and the U.K.

SDDN-I will allow AT&T's virtual network customers to support data applications such as international videoconferencing, facsimile and data file transfers.

Initially, however, SDDN-I will not be able to support the advanced features generally associated with virtual nets, such as calling-line identification and automatic ringback.

"It would be pressing it to characterize SDDN-I as more than basic connectivity," said Ray Butkus, director of AT&T's Business International Services. He said a protocol — the International SDN User Part — that will provide for the interoperability of enhanced switched services worldwide is under development but is not ready. When the protocol becomes available, AT&T's SDDN-I service will be able to support advanced features.

Butkus said AT&T has not yet filed a tariff for SDDN-I but rates (continued on page 51)

Sybase offers NLM version of SQL Server

By Timothy O'Brien
West Coast Bureau Chief

EMERYVILLE, Calif. — As expected, Sybase, Inc. last week announced a NetWare Loadable Module (NLM) version of its SQL Server database server that positions the company to benefit from the huge growth expected in LAN-based applications.

The Sybase SQL Server for NetWare, Release 4.2, due out later this month, will help Novell, Inc. NetWare users deploy on-line transaction-oriented and real-time decision support applications that use local data and tap into other SQL Servers on OS/2, Unix or Digital Equipment Corp. VAX platforms.

The NetWare implementation is a major step forward for Sy-

base, which since 1988, has been a partner with Microsoft Corp. in providing SQL Server for OS/2.

Stewart Schuster, vice-president of marketing for Sybase, said the move is important because it will allow Sybase to take advantage of the "mainstream growth opportunity" represented by NetWare's huge market share.

"High-performance applications are Sybase's strength," said Tom Wood, senior analyst with the Business Research Group in Newton, Mass. "They are making the move to NetWare before the market for LAN-based applications explodes."

Pros and cons

While Sybase is not discussing any numbers, running a database server as an NLM can offer users performance advantages.

However, some experts have expressed concerns about supporting mission-critical applications on database NLMs because NetWare does not "protect" applications from occupying the same memory space, which can cause a system crash, and does not provide rich processor scheduling functions or memory management capabilities ("NetWare users explore the dark side of NLM databases," *NW*, April 27).

Schuster acknowledged the problems and said users will have to exercise caution. Some applications may need to be deployed on stand-alone database servers, while others are appropriate for the NetWare file server, he said.

He claimed that Sybase's multithreaded server architecture, which allows SQL Server to oper-

ate somewhat independently of the operating system, will alleviate some of the problems.

The architecture reduces operating system overhead and optimizes memory utilization because it allows the database, rather than the operating system, to schedule tasks. Thus, Sybase said, it is possible for SQL Server to maintain high throughput and low response times as more users are added to the system.

SQL Server is the first database server for NetWare that employs server-enforced integrity. SQL Server for NetWare allows users to code business rules and transactions in the database server itself to protect the data from being changed by invalid requests.

To provide data access from the NetWare local-area network to other data sources across an enterprise network, the NLM version of SQL Server supports Novell's Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX) protocol as well as the Transmission Control Protocol/Internet Protocol.

Sybase offers a variety of connectivity and gateway tools that will enable the SQL Server for NetWare to communicate with other SQL Servers as well as other data sources and applications. For example, gateways provide access to other leading databases such as Oracle Corp.'s Oracle Server and IBM's DB2.

The SQL Server for NetWare, Release 4.2 costs \$1,995 for a single user, \$4,995 for two to eight users, \$8,995 for nine to 16 users, \$15,995 for 17 to 32 users and \$29,995 for unlimited users. □

Major LAN vendors team for workstation standard

By Margie Wylie
Senior Editor

WASHINGTON, D.C. — Some of the biggest names in local-area networking last week said they are putting their heads together to develop a way to remotely manage network nodes.

At INTEROP 92, held here, Intel Corp., Microsoft Corp. and Novell, Inc. announced they were forming a group that will devise a protocol-independent standard for managing not the net itself, but all the workstations connected to it.

"Network administrators are coming to vendors and saying they can manage the infrastructure, the WAN and the routers, but managing each workstation on the LAN is taking 90% of their time," said Jim Flach, vice-president of Intel's PC Enhancement Division. "It's driving them crazy."

The unnamed consortium plans to define a common set of services and information that workstation management agents should provide, along with a common application program interface (API) that will let different management packages access those services and information.

"Things like Simple Network Management Protocol tend to stop at the adapter," Flach said. "[The specification] will go the last inch" so managers can reach into a workstation and gather information or make changes.

The standard will cover such functions as retrieving hardware and software configurations, as well as installing or upgrading

software remotely.

Intel currently offers an application, called LANSight, aimed at managing network stations. However, Flach denies that the group will base its standard on Intel's technology.

Users who look askance at the announcement of yet another vendor group should be reassured by this one's membership,



said Jodi Mardesich, a San Francisco-based analyst for The Burton Group, a consulting firm headquartered in Salt Lake City.

"In this case, it's pretty significant that Novell and Microsoft are working on this because [they] are the two companies that can actually make something happen," Mardesich said. "They control most of the network clients out there."

That doesn't guarantee that the going won't be rough. The group seems to have already hit its first point of dissension. Novell, Microsoft and 15 other vendors this week endorsed a common API for tracking software licensing over the network, a function this specification is also supposed to address.

"That's the very mistake we want to avoid," Flach said. "What we need is one generic set of functions for one generic agent on which you can build all sorts of applications."

Sun Microsystems, Inc. offered a halfhearted endorsement but stopped short of contributing to the group's effort, saying its SunNet Manager will encompass any number of standards. □

Group's new specification to ease SMDS management

By Bob Wallace
Senior Editor

WASHINGTON, D.C. — The Switched Multimegabit Data Service Interest Group (SMDSIG) last week detailed a specification it has developed that should result in improved SMDS management capabilities.

The new specification paves the way for equipment vendors to build products capable of passing network management information over a Data Exchange Interface (DXI), a standard DSU-to-router link. The specification is called the DXI-Local Manage-

ment Interface (LMI) and is viewed as critical to existing and prospective SMDS users.

"Today, [data service unit/channel service units] collect a wealth of information about SMDS, but there's no standardized means for getting that data to routers and [then] up to a network management workstation," said Tracy Cox, a member of Bell Communications Research's technical staff. "With DXI-LMI, we've solved this problem."

DXI-LMI will enable a user at a Simple Network Management Pro-

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Correction: A story titled "Examining frame relay performance" (*NW*, April 6) listed 15 msec as the switching latency for Sprint Corp.'s TP4900 packet switch, which is used to support the company's frame relay service.

The 15-msec figure is the latency delay for processing X.25 packets. According to Sprint, the switching latency for frame relay frames is 3.3 msec.

NetView to gain Ethernet, frame relay abilities

By Michael Cooney
Senior Editor

WASHINGTON, D.C. — IBM last week tacked Ethernet and frame relay net management capabilities onto the multitude of features to be included in the next release of its NetView network management platform.

As expected, IBM announced NetView Version 2 Release 3 would become available Dec. 18 and bring with it access to IBM's first object-oriented network management database and improved management capability for non-System Network Architecture equipment ("IBM to announce NetView upgrades, availability date," *NW*, May 18).

Industry experts said this release of NetView will demonstrate how IBM intends to bring NetView into the multivendor net management world. Integral to that strategy is NetView's support of non-IBM local-area networks, analysts said.

Toward that end, IBM has given NetView the ability to receive alerts and alarms from Ethernet LANs connected to the mainframe through IBM's channel-attached 3172 controller or 8209 LAN Bridge.

According to IBM, Ethernets will be managed by NetView just as Token-Ring Networks are today. That means NetView will be able to monitor Ethernet LANs and send down commands to fix problems.

Ethernet support in NetView fulfills a pledge IBM made last year when it began supporting the technology on its 3745 front-end processor. Likewise, frame relay support in NetView is also the fulfillment of an IBM statement of direction made last June.

Frame relay net status and network topology data can be collected by a Simple Network Management Protocol manager in NetView. The VM version of NetView already supports SNMP, and MVS versions will support it early next year.

Initially, NetView will only be able to monitor a frame relay net, as opposed to controlling devices attached to the 3745.

NetView's frame relay support will coincide with the availability of the 3745's frame relay interface later this year.

Ethernet and frame relay support are not the only new features in the next release of NetView. Also included will be the Resource Object Data Manager (RODM), the centralized object-oriented database that will keep track of the systems and devices being managed by NetView or other SystemView applications.

"RODM will be used to share systems and network information with other vendors' platforms," said Lynn Wilczak, IBM's NetView product planning manager. "It is the point of integration for SNA and multi-vendor systems and net management."

Industry watchers have given the new NetView release a positive review but warn its full function may not be realized for a couple years.

"The functions IBM is giving users with

this release of NetView will give users a broad set of tools to work with," said Richard Diederich, president of Diederich & Associates, a NetView/PC software developer in South Pasadena, Calif. "But loading the object-oriented database is going to take a lot of work on the users part; there's going to be a long learning curve."

IBM said users can begin preparing for RODM by using the Network Configuration Application (NCA). NCA collects net configuration information and stores it in object form for IBM's Information/Management database and RODM. □

Compaq offers Insight into mgmt.

Sheds its hardware image to focus on net administration.

By Caryn Gillooly
Senior Editor

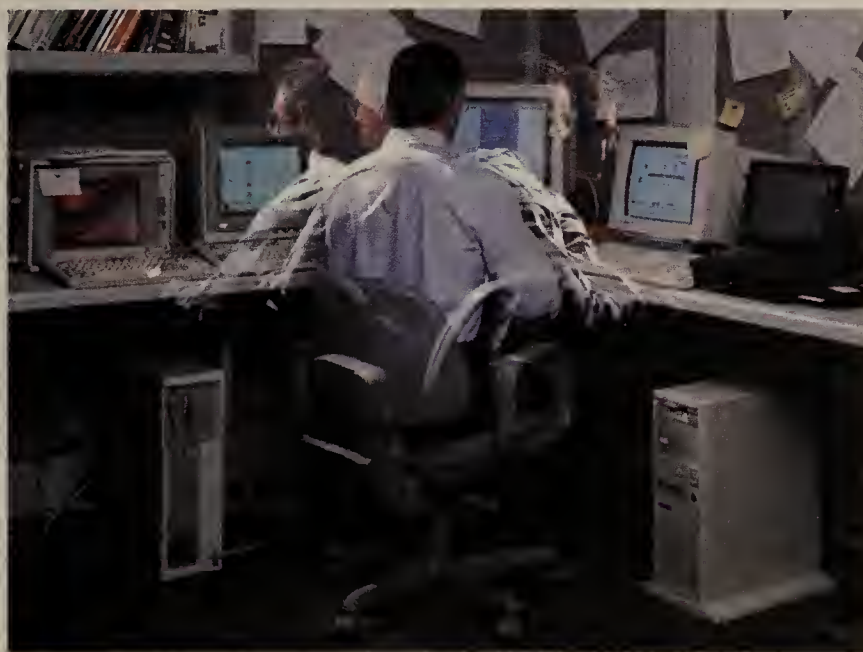
WASHINGTON, D.C. — The network management playing field got a little bigger last week as PC giant Compaq Computer Corp. unveiled Insight, a server management strategy the company hopes will help it transform from a hardware maker to a systems vendor.

Insight is a framework under which hardware and software products will be designed to give the administrator more in-depth management of Compaq servers.

"We're going to take a phased approach to server management," said Rod Schrock, director of systems product marketing for Compaq, based in Houston. "First, we'll

(continued on page 51)

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Net pioneers honored for innovations

By Bob Brown
Senior Editor

ATLANTA — Some of the network profession's pioneers were honored last week in the Call for Innovation competition at the International Communications Association's (ICA) 1992 Expo and Conference here.

Network executives from Domino's Pizza, Inc., National Car Rental System, Inc. and Unisys Corp. were recognized for their innovative applications of network technologies. The executives were winners of the 6th annual Call for Innovation awards, which are cosponsored by ICA and *Network World*.

Eight finalists were also recognized.

Daniel Gonos, manager of telecommunications for Domino's Pizza, won for an application called StoreFinder, which enables the

fast food company to route customers' calls to the nearest store for faster service.

The company worked closely with AT&T and AT&T Bell Laboratories to develop an automated call routing system that takes advantage of a nationwide 950 number and automatic number identification.

The application, which has been limited to a couple of test markets, is scheduled to be deployed nationwide by Domino's by the end of 1994.

Jack Livingston, executive vice-president and chief information officer at National, was recognized for his company's Computerized Asset Management System (CAMS).

The car rental firm equipped employees with hand-held computers, which are used in the car return lot to collect information that is communicated to a mainframe inventory system via mobile data service.

CAMS, which has helped National make more efficient use of cars and cut down on damage losses, is providing a payback of some \$2 million a year.

Ken Russo, director of the U.S. Information Systems Open Systems Center at Unisys, was presented with an award for his company's virtual computer room,

dubbed DemoNet.

Customers in any of the company's 25 geographically dispersed customer demonstration facilities can see Unisys' products work in an open systems environment across DemoNet, which is supported by the company's nationwide T-1 network.

Others cited in the Call for Innovation program were American Airlines Decision Technologies, Connecticut Mutual Life Insurance Co., Digital Equipment Corp., Ford Motor Co., Information Systems and Services, Inc., the National Institute of Standards and Technology, New York's Computer and Data Communications Services Agency, and the Philadelphia International and Houston Intercontinental airports. □



Daniel Gonos



Ken Russo

Users see ups and downs

continued from page 1

to be interfering with another radio-based net used by the city of Charlotte, N.C.

The stories of the two experiences with WaveLAN illustrate the issues users may face as they enter the wireless age.

First, the success story.

"It works great," said Nancy Anstoetter, operations manager at Hawkeye Bank, which completed installation of the NCR wireless system in March. "We're eliminating the cost of the phone lines, which were expensive."

Hawkeye runs a single 2M bit/sec Novell, Inc. NetWare LAN with about a half-dozen personal computers in each of its seven buildings. The only wire connection is a cable running from a LAN-attached router up to an antenna located on each site's rooftop, Anstoetter said.

The directional antenna system can transmit as far as five miles with a throughput of about 1M bit/sec, said Peter France, director of network systems for NCR's financial systems division. The system can connect LANs where there is a direct line-of-sight connection to another site.

WaveLAN is a spread-spectrum system operating in the

902-MHz to 928-MHz range of the Industry, Science and Medicine shared bands. Although users do not need a Federal Communications Commission frequency allocation license to use WaveLAN, if it causes interference to any system licensed in that range, the WaveLAN user is required to shut down operations until the problem is resolved. And that's what occurred in Mecklenburg County.

The city government of Charlotte, which uses a licensed radio-based metropolitan-area network from Multipoint Network Systems, Inc., said interference from a WaveLAN pilot test conducted by the county of Mecklenburg brought down the city's main data network.

For about two years, Charlotte has successfully used Multipoint's Radio Area Network (RAN) 19 digital equipment for wireless data sharing at 19.2K bit/sec among 18 city government offices and a central IBM 4381 mainframe ("N.C. city broadcasts SNA data via radio," *NW*, June 3, 1991).

"But about three weeks ago, I took a hit on the system," said Guy Hutchins, Charlotte's communications systems manager. That's when the trouble began.

Data traveling through the city's RAN 19 system was being dropped or garbled. Using spec-

trum analyzers, a team from the city traced the problem to one of the county's offices that shared a building with a Charlotte city agency. The county had just started testing NCR WaveLAN.

When confronted with the city's complaint, the county immediately ceased the WaveLAN test, eliminating interference.

Robert Pierce, Mecklenburg County's information systems manager, said the county, city, Multipoint and NCR are cooperating to identify the problem source. Theories range from antennas that are too close together to frequency overlap.

NCR representatives said the Charlotte case is the first to report a serious interference problem caused by an external source.

Susana Thompson, market development manager for WaveLAN, noted internal interference problems caused by spread-spectrum devices, such as security monitors, can slow down the wireless LAN's performance but seldom disrupt it to this extent. Both Hutchins and Daryl Maddox, NCR's senior product manager for WaveLAN, say the interference problems of spread-spectrum LANs is not a vote against wireless LANS, but instead a vote for establishing spectrum dedicated to their use — an idea now being considered by the FCC. □

IBM rollout plunges firm

continued from page 1

workstations, bridges or routers. The concentrator can operate with either a single- or dual-attachment to the FDDI ring.

Modules announced with the 8240 include an Optical Fiber Device Attachment Module and a Copper Device Attachment Module.

The fiber module conforms to the emerging ANSI FDDI specifications, while the copper module supports shielded twisted-pair wire and conforms to the FDDI over shielded twisted-pair specifications, called SDDI, recently backed by 11 industry vendors ("IBM leads rush to new FDDI spec," *NW*, May 18).

The maximum cable runs will be 2 km using FDDI specifications and up to 100 meters using SDDI.

According to Kekes, the concentrator modules are hot-swappable, meaning they can be replaced while the device is operating.

Workstation cards

Along with the concentrator, IBM released two FDDI workstation interfaces, the FDDI Fiber Base Adapter/A for FDDI-over-fiber connections and the FDDI Copper Base Adapter/A for FDDI-over-copper connections.

Both cards are 32-bit Micro Channel Architecture adapters for IBM's Personal System/2 Model 70 and above machines.

IBM also introduced a redundant option for the adapters, the FDDI Fiber Extender Adapter/A and the FDDI Copper Extender Adapter/A, which are able to step in if the main interface fails.

On the management side, IBM introduced an FDDI Simple Network Management Protocol Proxy Agent Program.

The program is an SNMP agent that runs on 8240-attached OS/2-based workstations, en-

abling the devices to be managed by IBM's AIX NetView/6000 and other SNMP-based management systems.

The agent can also send data to IBM's NetView management system via IBM's AIX-based service point, which converts the data into a NetView-compatible format.

IBM also unveiled the DatagLANce Network Analyzer, an FDDI-specific combination hardware/software network analyzer, which is similar to Net-

work General Corp.'s Sniffer, according to Franc Noel, FDDI hardware development manager at IBM.

DatagLANce provides real-time statistics as well as historical data about traffic traveling over an FDDI network, he said.

Finally, IBM brought out an FDDI Ring Diagnostic Tool, a device designed to help administrators troubleshoot problems with the FDDI ring itself.

According to Kekes, the firm plans to add FDDI support to the 6611 Network Processor, the router IBM unveiled in January, although he would not say when.

The company also plans to come out with a graphics-based LAN management application for AIX NetView/6000 that will let administrators see FDDI-based LANs within the corporate net.

IBM's 8240 FDDI Concentrator will cost \$13,500 for the base unit, \$6,140 for the Optical Fiber Device Attachment Module and \$4,040 for the Copper Device Attachment Module. The Fiber Base Adapter/A and Copper Base Adapter/A will cost \$3,995 and \$3,495, respectively.

The Fiber Extender Adapter/A is priced at \$1,995, while the Copper Extender Adapter/A is priced at \$1,495.

The DatagLANce Network Analyzer will cost \$49,500, and the FDDI SNMP Proxy Agent Program and FDDI Diagnostic Tool will be free of charge. All products will be available Sept. 25. □



Charting frame relay course

continued from page 1

poor, chairman of the forum's technical committee and a member of AT&T Bell Laboratories' Integrated Services Digital Network broadband planning technical staff. "The combined progress in these areas is enabling frame relay to mature quickly."

The forum believes that the creation of an implementors' agreement for frame relay multiprotocol encapsulation will enhance the service as a means of linking multivendor equipment.

Andrew Malis, a division engineer with BBN Communications

Corp., a Cambridge, Mass., switching systems vendor, said routers and bridges often use proprietary means of encapsulating packets for transmission, inhibiting device interoperability.

Tom Jones, president of the Frame Relay Forum and director of strategic accounts for Netrix Corp., a Herndon, Va., switch maker, said a common specification for encapsulating protocols will eliminate the need to use the same vendor's equipment at each end of a frame relay link.

"We've developed a common encapsulation [scheme] for multiple protocols, including SNA, DECnet, [Novell, Inc.'s] IPX and

(continued on page 48)



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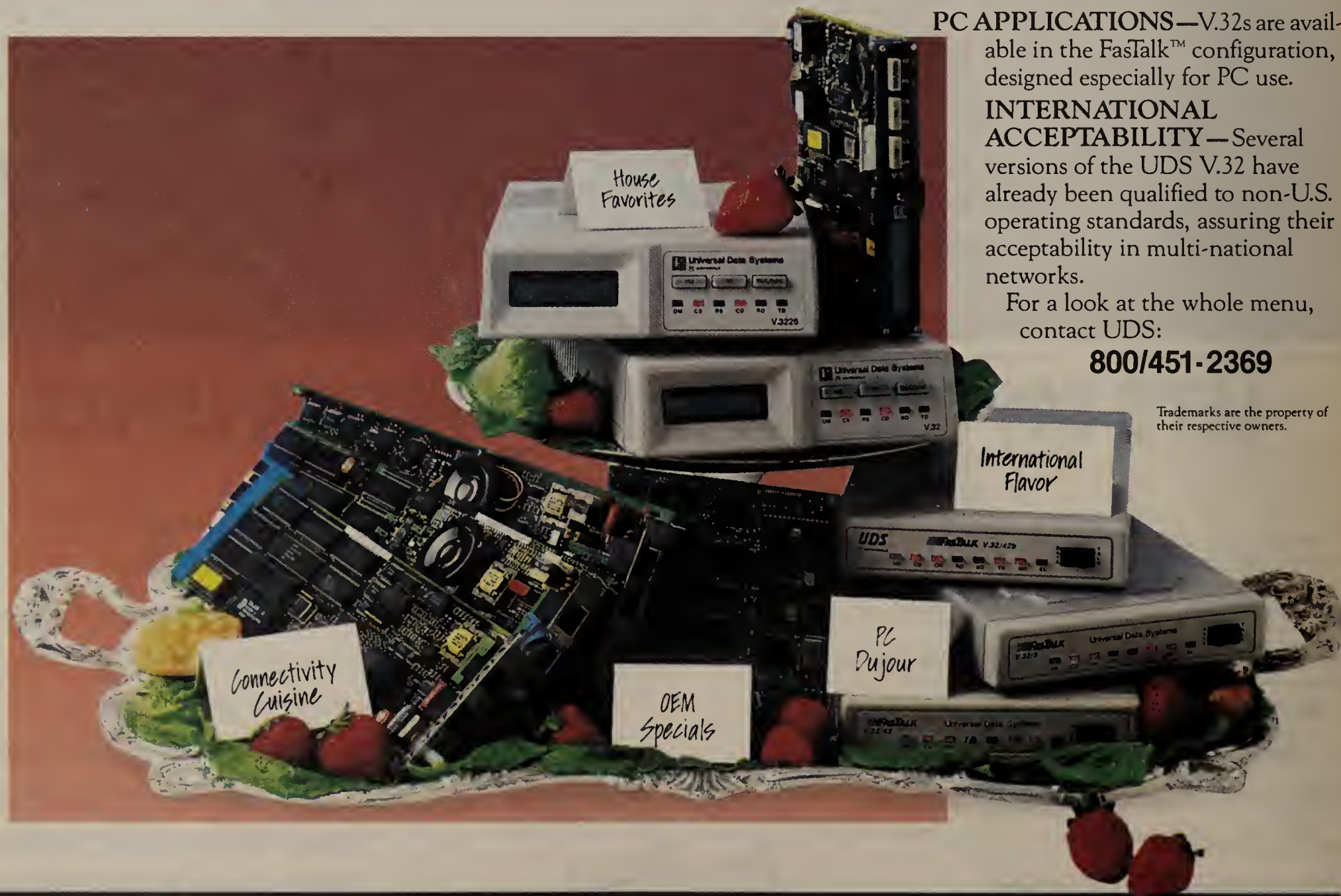
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Worth Noting

“The problem with SystemView is that everyone is looking for a big bang type of product rollout. SystemView isn't going to evolve that way; it's going to be much more incremental.”

Donald Czubek
President
Gen2 Ventures
Saratoga, Calif.

Network management budget projections

How much money will you spend on network management products this year?

Percentage of respondents



Figures are based on interviews with executives at 52 of the largest 1,000 U.S. firms.

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: FORRESTER RESEARCH, INC., CAMBRIDGE, MASS.

Retix woes highlight vendor GOSIP-compliance troubles

HP is only vendor to pass FTAM, X.400 tests.

By Ellen Messmer
Washington Correspondent

WASHINGTON, D.C. — Despite the fact that Retix has been named a key supplier of OSI products under several federal contracts, the company has yet to receive government-required conformance testing certifications for its products.

Under the Government Open Systems Interconnection Profile (GOSIP) Version 1 requirements, vendors must ensure that their products have passed conformance tests before product delivery dates — or, in some instances, a few months after — as called for in each contract.

Retix, which has begun supplying X.400 and File Transfer, Access and Management (FTAM) products to the defense services, has not yet shown that its products conform to federal OSI testing requirements.

The National Institute of Standards and Technology (NIST) launched its conformance testing program in November 1990, shortly after the GOSIP mandate took effect and recorded its first product entry in the NIST Register of Conformance-tested GOSIP products in April 1991.

More than 40 wide-area and transport products currently fill the NIST Register. However, the difficulty the industry has experienced in testing complex OSI applications for standards conformance is evident: To date, Hewlett-Packard Co. is the only company whose FTAM and X.400 products have passed the re-

quired tests that most agencies are now demanding from the vendors in requests for proposals.

One industry source recently said three vendors are known to have flunked the FTAM conformance test.

“You have to pass conformance tests and become registered in order to sell to the government,” said Jean-Phillipe Favreau, program manager for GOSIP.

Foot-dragging

Retix last year declared it would obtain registration for its products by the first quarter of 1992 (“Few products make it to GOSIP registry,” Aug. 26, 1991), but the company has not even taken the first step of sending its products out to an accredited laboratory for review.

“We were planning to do it but didn't quite get there,” acknowledged Malcolm White, director of strategic account management at Retix. “We've been slow; there's no doubt about it.”

Retix, which expects to spend at least \$300,000 for conformance testing, has been reluctant to lay out the money since there is no guarantee the government will actually purchase products under the contracts, according to White.

As a subcontractor for the Small Multiuser Standard Computing Requirements contract awarded to AT&T, Retix is supplying FTAM, X.400 and Virtual Terminal products to the Air Force.

(continued on page 16)

McDATA announces SDLC concentrators

LinkMaster 7200 converts SDLC, X.25 traffic to LLC for communication across Token Rings.

By Michael Cooney
Senior Editor

BROOMFIELD, Colo. — McDATA Corp. last week entered the blossoming Synchronous Data Link Control concentrator market with a new controller family that lets users tie SDLC and X.25 links to IBM Token-Ring Networks for communication with a mainframe.

The McDATA LinkMaster 7200 series simplifies net configurations by concentrating SDLC or X.25 traffic and converting it to Logical Link Control (LLC) for communication across Token-Ring local-area networks. The new controllers also let users extend the life of their older Systems Network Architecture SDLC subsystems while migrating to the LAN internet world.

The 7200 comes in three models built on Sync Research, Inc.'s SNA Network Access Controller for Token Ring (SNAC/TR) hardware and software. All three

models are expandable to support four to 16 ports.

Model 1 is an SDLC concentrator capable of reducing 16 incoming SDLC lines or 32 terminal links to one 56K bit/sec line for communication with a front-end processor and mainframe.

The Model 2 resides on Token-Ring LANs and converts SDLC communications into the LLC2 format, enabling SDLC devices to communicate across bridged internets rather than leased lines.

Model 3 also resides on Token Rings but supports X.25 interfaces, meaning 3270 devices supported by X.25-based nets can access a mainframe without requiring the Network Control Program Packet Switching Interface (NPSI), the IBM software on the front-end processor (FEP) that handles X.25 communication. The 7200 does this by converting X.25 Qualified Logical Link Control datastreams into LLC and

(continued on page 10)

DEC unveils software for users of SNA

By Jim Duffy
Senior Editor

LITTLETON, Mass. — Digital Equipment Corp. recently unveiled gateway and application software that enables IBM Systems Network Architecture users to access VMS applications in a DECnet network.

DEC also reduced prices on some of its Fiber Distributed Data Interface bridge and controller products by as much as 59%.

DEC brought out SNA Domain Gateway for Channel Transport (Domain Gateway-CT) software, which provides users of IBM 3270 terminals and personal computers in an SNA net with access to a DECnet environment through transport protocol translation. DEC also unveiled SNA 3270 Applications Services software, which allows users to develop

VMS applications that can communicate, through Domain Gateway-CT, with 3270 applications in an SNA network using the 3270 data stream.

Domain Gateway-CT runs on DEC's ChannelServer and ChannelServer II hardware platforms, dedicated gateways that use bus-and-tag connections for linking to an IBM mainframe channel.

The software makes an attached DECnet network, where the VMS applications reside, look like an SNA subarea to the IBM host, according to DEC. This allows 3270 users to establish sessions with the DEC environment as if the VMS application were in an SNA network.

SNA 3270 Application Services, meanwhile, allows developers to build VMS-based applications that use native LU Type 1, 2 and 3 protocols in order to communicate with 3270 applications through Domain Gateway-CT. The software also includes application program interfaces to which users can write applications that allow them to print ASCII files on an IBM printer in

(continued on page 16)

Data Packets

FastComm Communications Corp. of Sterling, Va., last week announced a new desktop line concentrator for routers that consolidates 24 56K bit/sec lines onto a single T-1 circuit. The Turbo Concentrator F8150-X can also be upgraded to contain a frame relay interface that lets the router support 24 lines through one V.35 interface, saving on line costs and interface cards while freeing up router chassis slots.

The Turbo Concentrator contains a single T-1 port and one V.35 port. It is available now for \$7,000.

Candle Corp. recently said it successfully tested interoperability between an MVS mainframe and an OS/2 workstation in a client/server environment using the Open Software Foundation, Inc.'s (OSF) Distributed Computing Environment (DCE) technology. Candle claims this is the industry's first implementation of DCE on MVS.

As a result of the test, Candle and OSF said they will jointly demonstrate successful implementation of DCE application program interfaces in MVS environments. □

Rabbit software lets users jump in the SmartPool

By Michael Cooney
Senior Editor

MALVERN, Pa. — Rabbit Software Corp. last week added new software to its DOS-based Open Advantage SNA gateway that will let users pool multiple gateways to provide gateway backup, com-

munications and load-balancing features.

The new SmartPool software will help network administrators with multiple Rabbit gateways increase their application availability and network performance.

SmartPool resides primarily

on the gateway, with some code located on attached personal computers. In the event of a gateway failure, the SmartPool code on the PC will automatically route sessions around the failed gateway to an alternative gateway in the pool and then reestablish them.

The new cross-gateway pooling feature allows network administrators to designate sets of gateways that can be shared by remote users. This has the effect

of reducing the amount of gateways needed in the enterprise, said Charles Robins, senior vice-president of technology at Rabbit. As new users are added, they can be assigned to an existing gateway pool so new gateways do not have to be added, he said.

A load-balancing feature automatically spreads the data load over the pooled gateways, keeping net performance as high as possible, according to analysts.

"For users with multiple gate-

ways, load-balancing is a key network performance feature," said Lucinda Santisario, an analyst at International Data Corp. (IDC), a market research firm in Framingham, Mass.

A subpooling feature lets users break their gateways down even further — from larger pools into several smaller ones. This allows users to automatically allocate sessions to specific departments, Robins explained.

(continued on page 16)

McDATA offers concentrators

continued from page 9

then sending the transmission across the LAN.

"The Model 3 lets users utilize X.25 networks without incurring IBM FEP upgrade costs or having to deal with the NPST's complexity," said Paul Sikorski, McDATA's product manager for the 7200.

The SDLC concentrating features in the 7200 Models 1 and 2 make the 7200 a possible replacement for IBM 3745 FEPs in remote locations, Sikorski said.

"Many users operate a 3745 for remote line concentration," he said. "Consolidating lines through the 7200 instead can reduce the FEP's work load, prolong the life of a FEP or reduce the need for a new one."

The McDATA boxes join Sync Research's SNAC/TR and the recently announced Netlink, Inc. SDLC Link Server ("Netlink lets SNA devices attach to Ethernet LANs," *NW*, May 4) in the growing SDLC concentrator field. Analysts said the desire to grow LAN internets and get the most out of existing equipment is driving the need for these products.

The primary difference between the McDATA/Sync Research and Netlink boxes are the networks they support. Neither the McDATA nor the Sync controllers support Ethernet LANs, while the Netlink box doesn't support X.25.

McDATA, however, indicated that Ethernet support could be added by year end. All three support Token-Ring LANs and are manageable by NetView or their own local management facilities.

The McDATA Model 1 costs \$7,995, while the Models 2 and 3 sell for \$9,650.

The Model 1 supports a maximum of four ports with as many as 32 multiplexed lines attached. Each of the three models can be upgraded to 16 ports.

By comparison, Netlink's Model 1, supporting two SDLC ports, sells for \$6,490. The four-port Model 2 sells for \$9,450. The Ethernet Model 3 sells for \$10,695 and comes with four SDLC ports, expandable to 16. **■**

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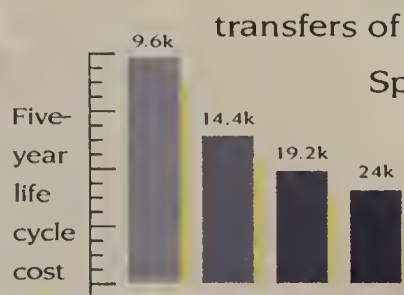


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David Hauger
Product manager
IBM's Network Server Product
Entry Systems Division
Boca Raton, Fla.

Additions to Sun SPARC family offer built-in BRI

Devices also to support SuperSPARC RISC chip.

By Margie Wylie
Senior Editor

SAN FRANCISCO — The raspberry was almost audible here last week as Sun Microsystems, Inc. thumbed its nose at critics who've pronounced its SPARC line dead by introducing four mid-range Unix machines designed to fill the gap between its workstation and high-end server products.

Housed in a casing about the size of two stacked pizza boxes, the same basic four models are offered in two lines, the SPARCstation 10 and SPARCserver 10. The machines are the first to support Sun's and Texas Instruments, Inc.'s jointly developed 50-MHz SuperSPARC Reduced Instruction Set Computing chip in single and multiprocessor configurations.

A new plug-in processor board lets users swap single-processor

cards for two- or four-processor configurations.

The new computers will also be the first to include built-in Integrated Services Digital Network Basic Rate Interface (BRI) connections. BRI offers two 64K bit/sec B channels and one 16K bit/sec D channel, which developers can take advantage of by writing applications to Sun's ISDN application program interface.

Sun will ship with the computers drivers that will let any application currently using the Transmission Control Protocol/Internet Protocol pass over one of the BRI 64K bit/sec channels.

The company also offers on-board Ethernet with the buyer's choice of 10Base-T, thin-net or thick-net connections. The line also offers 1M byte of random-access memory server cache, and improved memory, disk and bus

(continued on page 15)

NeXT to license software capability to third parties

By Margie Wylie
Senior Editor

REDWOOD CITY, Calif. — Facing steadily dropping hardware prices, NeXT, Inc. is looking to capitalize on it NeXTStep software by allowing third parties to port its administration capabilities to other workstations.

Based here, the company last week announced it is licensing the source code to its NetInfo software. NeXT also said that one company has already ported its software to run on rival Sun Microsystems, Inc. SPARCstations.

NetInfo, which features a slick graphical user interface, currently ships as part of NeXTStep, the highly touted version of Unix for NeXT's workstations.

Like other Unix administration software, NetInfo is based on a distributed database that tracks user and volume names, access privileges, aliases and other information crucial to setting up and running a Unix network.

NetInfo is similar to the proprietary tools used to administer, for example, a Novell, Inc. NetWare or Banyan Systems, Inc. lo-

cal-area network. It should not be confused with management systems designed to keep tabs on a physical network, such as IBM's NetView.

Codex Software Development Pty., Ltd. of Albert Park, Australia has ported the client portion of NetInfo (called a daemon) to SPARCstations.

NetInfo is based on a distributed database that tracks information crucial to running a Unix net.

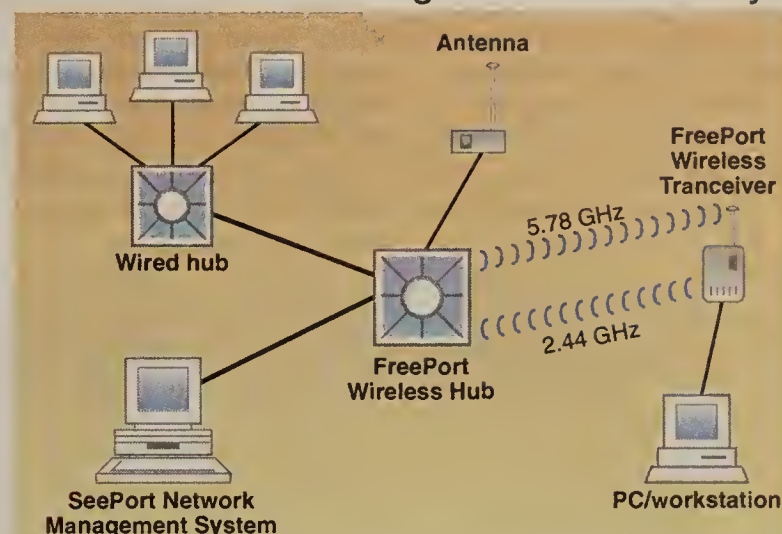
▲▲▲

At \$495 per station, the NetInfo for Sun daemon will let users administer Sun workstations from a NeXT workstation using the graphical management programs that ship with NeXTStep.

“NetInfo will give Sun users

(continued on page 15)

Wireless networking the Windata way



Windata's FreePort Wireless Hub communicates with desktop computers attached to transceivers up to 80 meters away. The Ethernet hub can be hard-wired to other LAN hubs and managed by Windata's SNMP-based SeePort Network Management System.

GRAPHIC BY SUSAN SLATER

SOURCE: WINDATA, INC., NORTHBOROUGH, MASS.

Start-up to roll out wireless local net

Windata offers SNMP software for managing its LANs, pens reseller agreement with Cabletron.

By Bob Brown
Senior Editor

NORTHBOROUGH, Mass. — Windata, Inc. has unveiled a wireless Ethernet LAN that will complement, as well as compete against, traditional local-area networks.

The start-up also introduced Simple Network Management Protocol software for handling its LANs and an agreement through which Cabletron Systems, Inc. will resell Windata gear under a private label and cooperate in building a wireless LAN module for Cabletron's hub.

Windata discussed plans to roll out a token-ring version of its product early next year, a wireless bridge-like device to link Ethernets in separate buildings and a version of its wireless LAN supporting portable personal computers (see “Windata outlines future direction,” page 14).

The FreePort Wireless LAN is useful for net users facing constant workstation moves and changes, as well as for hard-to-wire buildings. It can also be used for temporary network needs, such as trade shows; on factory floors, where machinery can create electrical interference for traditional nets; and for backup.

FreePort will complement traditional LANs, said Greg Hopkins, former Ungermann-Bass, Inc. vice-president of engineering

who founded Windata in 1990 and serves as the firm's chairman and chief executive officer. “We're proposing a wire augmentation strategy, not a wire replacement strategy,” he said.

Wallace Smith, Windata's president and chief operating officer, said FreePort will also challenge them on throughput and price. FreePort boasts actual Ethernet throughput of 5.7M bit/sec and is priced from \$345 to \$1,142 per user, depending on configuration.

FreePort consists of a central hub and antenna, plus a transceiver for each PC or workstation. A Multi-User Interface Option is available that allows as many as eight users to share a single transceiver.

Desktop devices can be located as far as 80 meters from the hub, which is available in models supporting up to 32 or 64 transceivers and as many as 256 users. Windata uses spread-spectrum radio technology so users do not need a license to operate the LAN. Transceivers send Ethernet packets to the hub on the 2.44-GHz frequency, while the hub broadcasts data on 5.78 GHz.

The LANs can be managed via Windata's SeePort Network Management System, an SNMP-based application that includes the SeePort Network Management User

(continued on page 14)

Netnotes

3Com Corp. last week released what the company said was the industry's lowest priced Extended Industry Standard Architecture (EISA) Fiber Distributed Data Interface network adapters.

The new FDDILink family, unveiled at INTEROP 92 Spring in Washington, D.C., consists of 32-bit workstation adapter cards that support 100M bit/sec transmission over both fiber and copper cables.

Although the release includes a card providing for transmission over shielded twisted-pair wire, it did not include one for transmission over unshielded twisted pair. However, 3Com said it will ship an unshielded offering when that ANSI standard is complete.

FDDILink-F for fiber-based FDDI and FDDILink-STP for shielded twisted pair-based FDDI cost \$1,900 and \$1,300, respectively. 3Com, based in Santa Clara, Calif., did not provide a more specific timetable for the unshielded twisted pair-based FDDI adapter, dubbed FDDILink-UTP, nor did it provide pricing.

BICC Communications of Auburn, Mass., announced

(continued on page 15)

Start-up rolls out wireless net

continued from page 13

Interface running under Microsoft Corp. Windows. It also includes a hub-based SNMP agent that feeds data to the SeePort interface or any other SNMP management system.

Jennifer Pigg, a program manager at The Yankee Group, a market research firm in Boston, said Windata has taken a lot of the good points from other wireless LANs and combined them.

She said FreePort offers better throughput than wireless LANs from such vendors as BICC Communications, Motorola, Inc. and NCR Corp. Like NCR, Windata uses spread-spectrum transmission, which relieves line-of-site configuration restrictions.

Ed Wilk, network manager for WHDH-TV in Boston, said his company plans to beta test the Windata products. "In the television business, we often need to set things up in a hurry, and wireless LANs appear to be a good solution," he said.

Windata will begin shipping FreePort in July. A hub supporting 32 transceivers costs \$4,695, the 64-transceiver hub costs \$5,895, transceivers are priced at \$995 each, and the Multi-User Interface Option costs \$595. The SeePort Network Management User Interface costs \$1,950, and the agent costs \$445.

Windata will sell its products mainly through OEMs and resellers. Cabletron is the first to announce an OEM relationship with Windata and will sell the products under the Freeline label. ■

Windata outlines future direction

Windata, Inc. doesn't just have its sights set on the wireless Ethernet market. The Northborough, Mass.-based start-up is also planning to offer products addressing high-growth markets, such as token-ring networks and portable computers.

Windata will offer a wireless token ring built along the same lines as its FreePort Wireless LAN for Ethernet. Details about the product, expected to boast throughput of up to 5.7M bit/sec, will be released in about six

months. The token ring is expected to start shipping in the first quarter of next year.

Windata's offering for portable computer users will consist of a microhub, minitransceivers and network adapter cards for the portable computers themselves.

The products will enable portable computers within a building to tie into the corporate network via Windata's wireless technology. The microhub will use spread spectrum to commu-

nicate with the larger FreePort Ethernet and token-ring hubs.

Details will be unveiled in the first quarter of 1993. The products are scheduled to ship in the second quarter of next year.

Windata also plans a version of its hub that will bridge Ethernets in separate buildings. It will be available in the fourth quarter. Windata plans to roll out a transceiver packaged on a network interface card early next year.

— Bob Brown

Novell boosts client access to IBM hosts, Unix servers

Workplace for DOS gets TN3270, NFS support.

By Caryn Gillooly
Senior Editor

SAN JOSE, Calif. — Novell, Inc. last week announced enhancements to its LAN Workplace for DOS client software that will give NetWare clients improved access to IBM hosts and Unix servers.

Novell added support for TN3270, the Transmission Control Protocol/Internet Protocol IBM 3270 terminal-emulation protocol, which will give LAN Workplace for DOS users access to applications on IBM mainframes over a TCP/IP network. Additionally, Novell added NFS Client, an implementation of the Network File System that will provide access to Unix servers over TCP/IP nets.

"As enterprise networks built on TCP/IP become more prevalent, customers require desktop connectivity to a variety of host systems, including NFS servers and IBM mainframes," said Bob Davis, director of marketing for

Novell's Unix connectivity products, located here.

LAN Workplace for DOS is basically an implementation of the TCP/IP protocol stack within an individual DOS- or Microsoft Corp. Windows-based local-area

“Customers require desktop connectivity to a variety of host systems.”

▲▲▲

network workstation. Previously, the product supported terminal emulation through Telnet sessions, which provided access to Digital Equipment Corp. VAX environments but not IBM hosts.

With the new TN3270 feature, users will be able to log on to an

With 3Com's new hub security, you can share a lot,



Chances are, anyone on your LAN has access to everything on your LAN.

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IBM mainframe running the MVS or VM operating system and run mainframe applications without modification, providing the host is also running a TCP/IP stack.

On the Unix side, LAN Workplace for DOS previously supported the Unix File Transfer Protocol, not NFS, which meant users had to know which files they wanted to access on each Unix server. NFS support makes that access transparent, enabling the user to access files on remote NFS-based servers as if those files were resident on the users' local hard drive.

With the NFS support, administrators will also be able to direct DOS printer ports directly to Unix-based print queues, letting NetWare clients send print jobs directly to Unix-based printers. In the past, users had to send files to Unix-based servers, which would then send those files to Unix printers.

Both the TN3270 and NFS Client options for LAN Workplace for DOS will be available next month.

The TN3270 will cost \$145 for one user, \$645 for 10 users and \$3,995 for 100 users. The NFS Client will cost \$295 for one user, \$1,395 for 10 users and \$8,495 for 100 users. ■

SPARCs offer built-in BRI

continued from page 13
subsystems for better I/O.

"We're not just a workstation company anymore," said one Sun official, noting that the firm is trying to extract itself from the fierce competition to deliver more raw horsepower for less money.

Instead, the firm said it intends to design full-featured workstations and servers that meet the needs of not only their primary market of technical users, but also other power users in other markets such as finance.

NeXT to license capability

continued from page 13

the kind of administration features they can expect in the next release of the Sun [operating system, Solaris 2.0]. Only they get them today," said Matthew Pryor, director of software technology for Codex Software.

For example, Sun's Network Information Service (NIS) — NetInfo's counterpart — must replace all the files in a database every time one entry is changed,

In the personal computer market, Sun is running its SPARCserver 10 line against Compaq Computer Corp.'s Intel-based SystemPro multiprocessor server.

Sun officials said the SPARCserver 10 running NetWare SunLink will make a powerful PC LAN server. NetWare SunLink is the server software for Solaris, Sun's Unix-based operating system.

Pricing for the SPARCstation 10 starts at \$18,495 for one processor and increases to \$39,995 for four.

SPARCserver 10 models — basically SPARCstations without the monitor and with a tape back-

up, CDROM drive, extra cache and more disk space — start at \$16,995 for the Model 30, with one processor, and increase to \$55,295 for the Model 54, which has four processors. Upgrades from previous SPARCstations, such as the IPX or IPC, are available.

Single-processor versions of the new computers will start shipping this summer. Multiprocessor versions are due in the fourth quarter.

Owners of Sun's MP600 line of high-end multiprocessor servers will also be able to upgrade to the new SuperSPARC chip later this year for \$6,000. ■

while NetInfo can propagate a single change. NetInfo also offers a hierarchical file structure and lets administrators organize logical domains of users and services.

Additionally, NetInfo is extensible, allowing software developers to add database categories. For example, a developer who creates a facsimile archiving application could add that service to the list of those managed by NetInfo. To that end, Codex Software also offers a \$1,250 NetInfo for Sun developer's kit.

The Australian firm is now

searching for a U.S. distributor for both NetInfo for Sun products, which are currently available only from Codex Software.

The company also plans to create graphical applications that let users administer NetInfo workstations, both Sun and NeXT, from a SPARCstation. Developers, value-added resellers and in-house programmers can license NetInfo source code for \$1,000 for internal use or \$2,000 plus a run-time fee of \$25 per application for commercial products. ■

Netnotes

continued from page 13

at INTEROP 92 Spring last week that it has added support for 16M bit/sec transmissions to its InfraLAN token-ring wireless local-area network product and made the product switchable between 4M and 16M bit/sec rates.

As with the previous version, each new InfraLAN base unit can serve as many as six workstations using two optical transceivers that transmit and receive infrared signals.

Each 4M/16M bit/sec base unit and two accompanying optical nodes cost \$3,795. The products are available now. The 4M bit/sec-only version is priced at \$2,795.

Allied Telesis, Inc. last week shipped a smaller 10Base-T transceiver that converts Apple Computer, Inc. Macintosh, IBM RISC System/6000 and Sun Microsystems, Inc. SPARCstation Ethernet cards to run on ubiquitous unshielded twisted-pair wire.

Priced at \$59.95, the AT-210TS' slim chassis will fit with any standard attachment unit interface (or thick-net) transceiver. ■

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3Com

DEC unveils pack for SNA users

continued from page 9

an SNA net. SNA 3270 Applications Services runs on DEC VAX, MicroVAX and VAXstation systems.

Domain Gateway-CT, priced from \$41,000 to \$91,000, should be available in August. Prices for SNA 3270 Applications Services, also expected for August availability, range from \$500 to \$30,000 for the run-time version and \$1,000 to \$69,000 for the development version.

DEC said price reductions for its Ethernet-to-FDDI bridges and FDDI controllers are the result of decreasing market prices for maturing FDDI technology.

DEC's DECbridge 500 and 600 products had been priced from \$21,000 to \$45,000 and now cost from \$15,000 to \$31,000, respectively, representing price reductions from 28% to 31%.

The DECbridge 500 connects one Ethernet local-area network to an FDDI ring, and the DECbridge 600 connects three Ethernet LANs to an FDDI network.

DEC's FDDIcontroller 700, which sup-

ports fiber connections between an FDDI ring and TURBOchannel bus-based DECstation 5000 and DECsystem 5900 workstations, now cost \$2,500, a decrease of 58% from \$6,000. And DEC's FDDIcontroller 700-C, which connects the DECstation 5000 and DECsystem 5900 to an FDDI net over copper wire, now costs \$1,850, a 59% drop from the previous price of \$4,500.

DEC will not reduce the price of its DECconcentrator 500 FDDI hub because it is already "aggressively" priced, said Karl Pieper, DEC's FDDI program manager. **■**

Retix woes highlight compliance troubles

continued from page 9

The vendor is also the source for OSI products under the Army's Small Multiuser Computer contract awarded to Electronic Data Systems Corp. and the Reserve Component Automation System contract awarded to The Boeing Co.

White said Retix is checking its products in-house for conformance and will select a NIST-accredited lab later in June to conduct accredited conformance testing procedures. He acknowledged that the in-house testing has been more difficult than anticipated. Retix's products may not make it into the NIST Register until the end of this year.

The Air Force only began accepting Retix product shipments in March due to a 15-month lag because of "bureaucracy and paperwork" from federal officials, White said, adding, "The Air Force is asking us to be certified in 90 days."

In the federal market, where competing vendors watch one another for the slightest infraction of federal procurement regulations, there is no recorded case of a vendor facing a contract challenge due to a violation of the GOSIP conformance testing requirements.

But NIST officials warn that there is only one definition of GOSIP compliance: a product that is on the NIST Register. "What's bad is that vendors are sometimes misleading these agencies," Favreau said. "They say they're GOSIP-complaint, but they're not." **■**

Rabbit users jump in the SmartPool

continued from page 10

The new software also eliminates the need for each gateway-attached PC to have a dedicated leased telephone line.

"Having a dedicated line for a user who isn't using the network much is ridiculous," said Stan Feidor, manager of data communications for the Medical Center of Delaware in Newark, a large Rabbit user currently evaluating the SmartPool feature. "Smartpool would let customers pool part-time users and utilize that line more efficiently."

Theoretically, customers can pool 255 gateways into a logical pool, Robins said, but the average user will collect anywhere from 10 to 50.

Analysts said the new features give Rabbit a leg up on other DOS gateway players, such as Attachmate Corp, but not enough to challenge market leaders Eicon Technology Corp. and Novell, Inc. Both have pooling capabilities and together control 50% of the DOS gateway market, according to IDC.

Rabbit had a 5.9% market share in 1991, IDC noted.

"The features will help users, but it will be hard to work against the overall features of Novell," Santisario said.

The SmartPool feature is available as a free upgrade for the current release of Open Advantage 5.0. It will be bundled with the 5.1 release, scheduled for the third quarter. The Open Advantage gateway costs between \$1,395 and \$4,290, depending on configuration. **■**

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INTERNETWORKS

LAN-TO-LAN AND LAN-TO-WAN EQUIPMENT AND STRATEGIES

Worth Noting

“Congestion control [on routers] is almost an insolvable problem. Most congestion control features will not substantially increase the efficiency of a network.”

Radia Perlman
Software consulting engineer
Digital Equipment Corp.
Maynard, Mass.

Link Notes

Asante Technologies, Inc. has rolled out a low-end 10Base-T hub and network management software that offer enterprise net features to work group and departmental users.

Together, the AsanteHub 1012 and AsanteView net management system offer graphical user interface-based in-band and out-of-band management from Apple Computer, Inc. Macintosh and Microsoft Corp. Windows platforms. The hub comes equipped with 12 RJ-45 ports, a 50-pin RJ-21 connector and a three-in-one port.

Both products will be available next month. The AsanteHub 1012 is priced at \$1,499, or \$1,999 with the AsanteView software, which costs \$999 if purchased separately.

SRI International, a research and consulting firm in Menlo Park, Calif., has released the first two volumes of its Internet Information Series. Internet:GettingStarted offers an overview of the Internet, and Internet:Mailing-Lists helps users contact others pursuing the same topic areas.

Both are available now for \$39 and \$35, respectively. ■

Sigma quadruples capacity of E-net module for hub

The ECS/1 can provide up to 20 Ethernet links.

By Skip MacAskill
Staff Writer

WASHINGTON, D.C. — Sigma Network Systems, Inc. last week unveiled a four-port Ethernet module for its Enterprise Communication Server (ECS)/1 that quadruples the number of Ethernet LANs the product supports.

The ECS/1 is an intelligent device that integrates the functions of a translation bridge, router and concentrator into a single unit. It offers internal bridging and routing between the multiple independent local-area nets supported by its 800M bit/sec bus.

The five-slot ECS/1 can be configured with as many as five of the four-port Quad Ethernet Input/Output Modules, providing a maximum of 20 Ethernet connections, up from the previous limit of five.

Each module supports four independent Ethernets and can interconnect the Ethernets with one another or other LANs sup-

ported by the ECS/1.

The module's attachment unit interface (AUI) ports can be used with various Ethernet cabling.

Like Sigma's existing dual-attached Fiber Distributed Data Interface card, single-AUI-port Ethernet module and 24-port 10Base-T Ethernet card, the quad modules are hot-swappable and powered by a Reduced Instruction Set Computing-based chip.

When used with these other modules, the box can be configured, for example, to support one FDDI and 16 independent Ethernets, or one FDDI and 96 10Base-T connections. It can handle the Transmission Control Protocol/Internet Protocol and Open Shortest Path First routing protocols and supports the Spanning Tree Algorithm. It has a bridging throughput rate of 59,520 packet/sec and a routing throughput of 59,000 packet/sec, according to the company.

(continued on page 19)

Dowty rolls out 5 new hub modules

By Skip MacAskill
Staff Writer

WASHINGTON, D.C. — Dowty Network Systems, Inc. last week introduced a number of new modules and capabilities for its third-generation hub, including the ability to support token-ring nets in combination with other types of LANs.

At INTEROP 92 Spring here, Dowty announced five new modules for its ScaNet System Center concentrator. They include three terminal server modules that support links to IBM, Digital Equipment Corp. and Unix hosts over various media, an FDDI routing module and a 10Base-FL concentrator module.

Also new to the hub, which comes in five- and 17-slot versions and has a 300M bit/sec bus, is the ability to support token-ring local-area networks in combination with Ethernet and Fiber Distributed Data Interface LANs.

The hub could previously support a mix of Ethernet and FDDI.

The five new modules, which are hot-swappable, each support the Transmission Control Protocol/Internet Protocol, Local Area Transport (LAT) and Open Systems Interconnection Transport Class 4 (TP4) protocols. The products can support Systems Network Architecture by using an external gateway that translates TCP/IP or OSI into SNA.

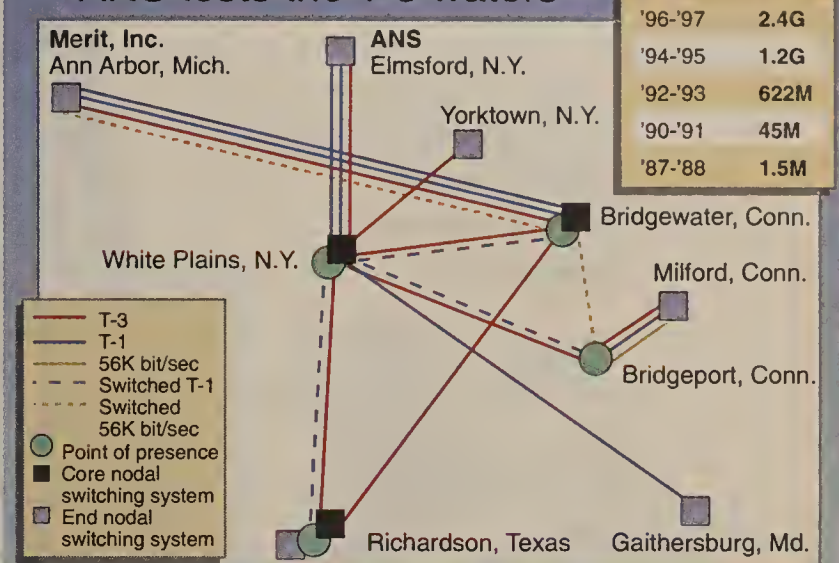
The cards also support the ScaNet Service Protocol, Dowty's proprietary net management protocol, as well as the Simple Network Management Protocol. Support for the OSI Common Management Information Protocol is slated for the future.

The first module, the 10Base-FL Concentrator, supports Fiber Optic Inter Repeater Link ports and 10Base-FL fiber connections to attached devices. Available in six- and 12-port versions, the 10Base-FL module allows one port to be used to connect a group of 10Base-T users to another 10Base-T LAN as far away as 2 km.

Another module, the asynchronous multiprotocol terminal server, has 16 ports, each of

(continued on page 19)

ANS tests the T-3 waters



ANS is testing prototype IBM RISC System/6000-based T-3 routers that will soon be deployed in the T-3 backbone the company supplies for the Internet.

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: ADVANCED NETWORK & SERVICES, INC., ELMSFORD

IBM routers to give ANS full T-3 support

New boards for prototype router will increase capacity for net that serves as Internet backbone.

By Ellen Messmer

Washington Correspondent

ELMSFORD, N.Y. — Within the next two months, Advanced Network & Services, Inc. (ANS) plans to upgrade the IBM prototype routers driving its national T-3 network to bring packet throughput up to full T-3 speed.

The IBM RISC System/6000-based routers used by ANS can currently process 10,000 to 12,000 200-byte packet/sec, roughly half the number of packets needed to fill a T-3 pipe. But new network interface cards, each containing a processor, will off-load packet-handling tasks from the RS/6000 and make it possible to route at true T-3 speed, ANS officials said here recently.

The upgrade, if successful, will represent one of the first implementations of a router-based clear channel T-3 network.

The 12-node ANS T-3 network provides the Internet's T-3 backbone services under funding from the National Science Foundation (NSF). ANS, set up as a nonprofit company by IBM, MCI Communications, Inc. and Merit, Inc., operates the T-3 net providing access to hundreds of thousands of Internet users worldwide.

Use of the ANS backbone has grown to serve 5,000 networks that generate more than 15 billion packets per month, up from roughly 200,000 packets and

200 networks in 1987, when ANS established the original T-1 NSF Network (NSFNET).

To accommodate the growth in traffic, ANS last year began migrating NSFNET to its T-3 network. Allan Weis, president and chief executive officer of ANS, said only a small number of sites remain on the NSFNET T-1 backbone, which will be phased out at the end of the year.

After some initial difficulty getting the T-3 network up and running, the network is now stabilized, and ANS is gearing up to take the next major step by bringing it up to full T-3 speed.

Weis said the extra processing power needed to reach that speed is required by the complex task of keeping track of so many network addresses while trying to process ever-increasing volumes of packets in a shorter period of time.

“Performance is a major area of focus,” said John Fjeld, director of network routing systems at IBM's Networking Systems unit. “There was a period when there were problems with the process.”

The Version 2 RS/6000 interface that ANS will deploy to bring the net up to full speed will improve routing efficiency by enabling each of the RS/6000's five T-3 interfaces to make routing decisions based on information maintained by the system process.

(continued on page 19)



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*Quality Is
Fundamental*

IBM routers to give ANS full T-3 support

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sor. With the current version, the RS/6000 processor has to make all the routing decisions.

Although IBM does not sell a RS/6000-based commercial router, Weis described the new router interfaces as product-level components, not prototype equipment.

But Fjeld downplayed conjecture about early commercialization of the router, noting that the market demands multiprotocol products and the prototype is only an Internet Protocol router that uses the Intermediate System to Intermediate System interior gateway protocol.

Fjeld said IBM would have to add support for protocols such as the Connectionless Network Protocol (CLNP), End System to Intermediate System and the Interdomain Routing Domain Protocol to meet commercial needs.

He emphasized, however, that the upgraded ANS version of the router will include CLNP — the Open Systems Interconnection equivalent of IP — as part of a dual-protocol stack so that users can route OSI packets across the ANS backbone.

Because Internet users feel every bump

Dowty rolls out 5 new hub modules

continued from page 17

which supports as many as five simultaneous sessions from host computers using up to three different protocols, including TCP/IP, LAT and TP4.

The IBM coaxial cable multiprotocol terminal server module, also in a 16-port version, provides connections to DEC VAX, Unix-based and IBM Application System/400 computers.

The 16-port IBM twinaxial cable terminal server module supports IBM 5250-type terminals and allows connection to IBM System 3X, AS/400, DEC and Unix host computers.

All terminal server modules have hot-key switching, which allows the user to switch between dissimilar computer systems, support 38.4Kbit/sec links on all 16 ports and provide keyboard mapping so users have a consistent user interface regardless of the computer employed.

The company also enhanced its existing routing module by adding support for frame relay and FDDI interfaces. The integral router is driven by a 64-bit Reduced Instruction Set Computing-based chip and also supports token-ring and Ethernet LANs, as well as the TCP/IP, OSI, DEC's DECnet and Novell, Inc. Internetwork Packet Exchange (IPX) protocols.

The number of ports supported varies, depending on configuration.

In addition to frame relay, the router also supports X.21 and X.25 wide-area interfaces and up to 64 T-1 links.

Available now, the 10Base-FL Concentrator ranges in price from \$1,750 to \$3,850; the asynchronous terminal server, also available now, costs \$2,700; the coaxial server module and twinaxial module will be available in the third quarter, and each costs \$3,900; the router, also available in the third quarter, is priced at \$5,800. ■

in the ride to ever-higher bandwidth, ANS has installed a T-1 "safety net" under the T-3, according to Weis.

"If something happens with the T-3 net, traffic is routed onto the T-1 until it's fixed," he said.

With traffic volumes doubling every 13 months, Weis said the T-3 network should be adequate for about a year.

ANS plans to adhere to its schedule to begin the conversion to a 622M bit/sec Synchronous Optical Network Optical Carrier-12 network by the end of this year or the beginning of 1993. ■

Sigma quadruples capacity of module

continued from page 17

With the ECS/1, the hub modules are internally bridged and routed, allowing for better throughput rates. The products' high-speed bus makes it suitable to function as a "backbone in a box."

"Depending on the modules you put in, the box can be used as a high-end 10Base-T hub, a bridge/router or in routed backbone applications," said Ashraf Dahod, president of Reading, Mass.-based Sigma.

The ECS/1 supports the Simple Network Management Protocol, so any standard SNMP-based net management system can control it. Also, it provides net monitoring and maintains statistics, such as the number of packets received and transmitted, on a per-LAN basis for each device.

The quad module is priced at \$3,950, while the base-unit ECS/1 costs \$13,250. The dual-attached FDDI module, single-port Ethernet card and 24-port 10Base-T module are priced at \$7,750, \$2,100 and \$3,950, respectively. Token-ring support is planned for later this year. ■



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Worth Noting

“More hackers go through voice mail systems to access a PBX than use the [direct-inward dial] ports to get to a switch.”

Paul Carney
Associate manager of
corporate security
AT&T
Basking Ridge, N.J.

New York Telephone tariffs ISDN PRI service

Name: ISDN Primary Service
Availability: July 24
Deployment: Metropolitan New York, with expansion of 25 to 30 central offices by 1993
Features: ANI (optional)
Call-by-call service selection (standard)
Price: A \$1,500 onetime installation charge and a \$1,000 monthly fee that includes the cost of a T-1. ANI costs an additional \$150 a month.

GRAPHIC BY SUSAN J. CHAMPENY

SOURCE: NEW YORK TELEPHONE CO., NEW YORK

New York Telephone adds PRI to its ISDN portfolio

By Bob Wallace
Senior Editor

NEW YORK — New York Telephone Co. last week detailed plans to deploy Integrated Services Digital Network Primary Rate Interface (PRI) service here beginning in late July.

The company will offer ISDN Primary Service with an optional automatic number identification feature as well as a standard call-by-call feature that will enable companies to use a single PRI link to access multiple inbound and outbound services.

The offering will be delivered using a handful of ISDN-equipped AT&T and Northern Telecom, Inc. switches. Jeanne Altenau, ISDN staff director of ISDN product development for the Nynex

Corp. companies, said New York Telephone will offer ISDN from 25 to 30 central office switches by next year.

Altenau said New York Telephone has already tested the service with users to ensure that it can be properly provisioned and works as expected.

The Primary Service will complement the carrier's ISDN Basic Rate Interface service, which became available here last April. The new service will be available July 24.

ISDN Primary Service carries a onetime \$1,500 installation fee and a \$1,000 monthly charge, which includes the cost of a T-1 line. The service's optional ANI feature will be priced at \$150 per month. □

Firm offers PC facilities mgmt. pack

By Bob Wallace
Senior Editor

ATLANTA — Stonehouse and Co. last week announced a personal computer-based version of its popular facilities management system at the International Communications Association's conference here.

The system, called Management of Network Income, Expense and Services (MONIES), enables net managers to process orders for station moves, adds or changes, manage inventory, perform chargebacks to end users and help reconcile vendor bills.

Stonehouse, based in Dallas, developed MONIES in 1983 to run on IBM mainframes. Now the system runs on any MS-DOS-based PC and includes one base

software module, called Profile, to manage six function-specific modules. Changes made to one module will automatically update all other modules.

MONIES' Service Order Management module enables users to convert equipment and network service requests to a standard service order format, while the system's inventory module lets users keep track of all network equipment and services.

The Financial Management module is a central repository for call accounting data. This information can be combined with the equipment's monthly rate for billback applications.

The Problem Management module enables users to open trouble tickets and track trouble resolution. Its Directory module contains a listing of all employees and their phone numbers, while the Network Analysis module lets users check net usage.

MONIES' PC version is available now and ranges in price from \$5,000 to \$120,000, depending on system configuration. □

FCC reverses ruling on discount bundles

Ban is lifted for cellular carriers only; opponents warn decision will hinder market competition.

By Anita Taff
Washington Bureau Chief

WASHINGTON, D.C. — Reversing a long-standing ban that prohibited carriers from offering discounted packages of equipment and regulated services, the Federal Communications Commission recently voted to allow cellular carriers to offer such bundled deals.

The rule change applies only to cellular carriers, but several opponents warned that the new bundling arrangement could harm competition in such emerging markets as personal communications service (PCS) as well as more traditional telecommunications equipment arenas. Critics say that such bundled packages could significantly decrease customer choice and keep service prices artificially high.

Concern about the rule change is not limited to those outside the agency.

FCC Commissioner Sherrie Marshall questioned how wise it is to try and carve out an exemption for the cellular market.

Marshall asked Robert Petit, general counsel for the FCC, whether exempting the cellular market from bundling rules is legal. He told her the new rules will stand up if challenged in court.

FCC Commissioner Ervin Duggan also expressed concerns. He said the standard practice today is to sell cellular equipment for as much as \$300 below cost. He argued that, in effect, revenue from the service is being used to subsidize equipment costs.

So even if customers can use their own equipment and purchase service for the same price as it is in bundled packages, they are still paying too much, Duggan said. This situation raises questions about whether customers purchasing service only are being discriminated against.

“The commission, by asking no serious questions about this apparent discrimination, in effect, blesses it — believing it perhaps too small a matter to care about,” Duggan said.

If customers are penalized for purchasing service and equipment separately, competition

could be harmed and cellular service prices may be kept artificially high, he explained. These are the same problems that critics say will arise in other sectors of the industry if bundling is permitted.

The FCC considered lifting or paring down its rules on bundling telecommunications equipment during a 1990 wide-ranging review it conducted into the long-distance industry's state of competition. After studying the matter for more than a year and faced with staunch opposition, the agency decided to leave the current rules in place.

But opponents fear that as technologies change and wireless communications systems are integrated into traditional systems, it may be impossible to sort out where the cellular exemption ends. “This ruling opens the possibility of setting a trend for other types of bundling,” said Leon Kestenbaum, counsel for Sprint Corp.

However, FCC officials argue that the cellular market is sufficiently different and that an exemption on equipment bundling is viable.

“The structure of the cellular industry is so unique that it is easy to create a distinction between this and other services,” Petit said, referring to the special rules that limit competition in the cellular market to a duopoly structure.

The cellular market evolved under this special set of rules, and Petit said exempting the industry from equipment bundling requirements is also feasible.

However, Petit acknowledged that it is unclear what effect the new rules will have on emerging markets, such as PCS, where rules on competition have not yet been laid out.

Additionally, agency officials, including FCC Chairman Alfred Sikes, said the new bundling rules will allow customers to continue saving money. He also said the new policy should encourage customers to trade in older analog cellular equipment and convert to the more efficient digital equipment that is currently on the market. □

Regulatory Update

New York-based bypass carrier **Teleport Communications Group, Inc.** has called the U.S. Telephone Association's (USTA) attempt to block the sale of Teleport to Cox Enterprises, Inc. and Tele-Communications, Inc. (TCI) a “ploy” in USTA's lobbying campaign to get Congress to lift the 1984 Cable Act cross-ownership prohibition.

USTA told the Federal Communications Commission that the ownership transfer of Teleport, owned by Merrill Lynch & Company, Inc., to Cox Enterprises, which owns 50% of the Staten Island Cable Co., is a violation of the Cable Act. The act prohibits local telephone companies with monopoly control of telephone poles and transmission conduits from owning and operating a cable television company in the telephone services arena.

TCI is the largest cable company in the U.S. but does not operate cable systems in any Teleport service area, the firm claims.

According to Teleport, it is not subject to the cross-ownership rules because it provides services via fiber-optic transmission facilities, not telephone poles or conduits as is needed by CATV companies.

USTA has until May 27 to file a response. □

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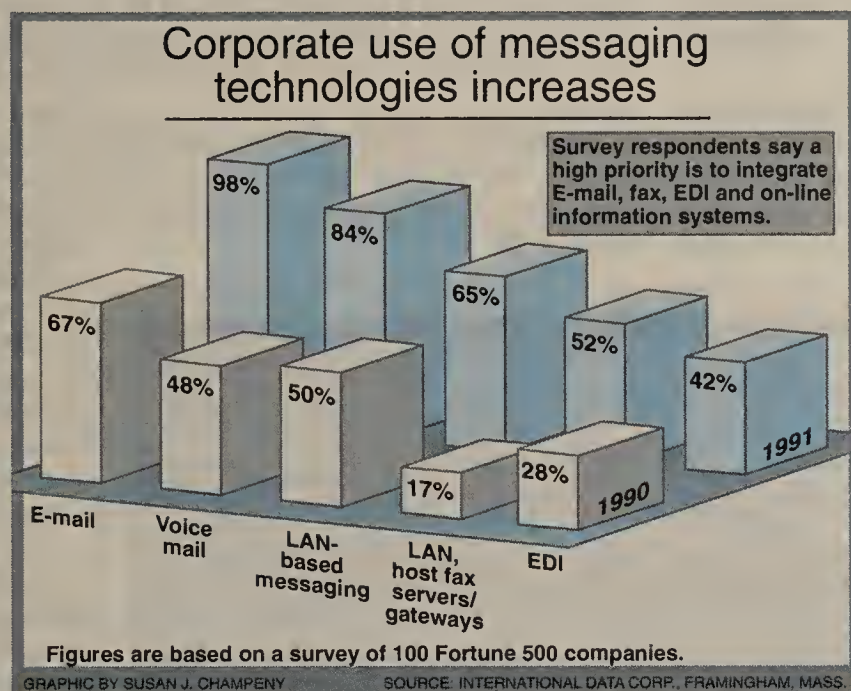
ENTERPRISE APPLICATIONS

CLIENT/SERVER AND ENABLING SOFTWARE: DISTRIBUTED DATABASE, MESSAGING, GROUPWARE AND IMAGING

Worth Noting

“The commercial success of multimedia does not hinge upon a single technology; it depends on the industry’s ability to create and justify strategic networked multimedia applications.”

Dixon Doll
General partner
Accel Partners
San Francisco



E-mail to be foundation of new information highways

Report details user efforts to integrate systems.

By Timothy O'Brien
West Coast Bureau Chief

FRAMINGHAM, Mass. — Corporations are looking to move E-mail beyond its traditional role to that of a transport mechanism for a variety of evolving multimedia technologies, according to a recent report by International Data Corp. (IDC) here.

“Electronic mail is evolving into a foundation for building enterprisewide multimedia information highways,” said IDC analyst Judith Rosall, author of “Multimedia and Integrated Messaging: An End User Survey.”

According to the survey, users give high priority to deploying and integrating products such as local-area network-based E-mail and facsimile offerings, electronic data interchange systems, X.400- and X.500-based systems, on-line information services and messaging application program interfaces (API). The report, based on interviews with 100 Fortune 500 corporations, reveals that E-mail, fax and voice mail are nearly as ubiquitous as the telephone. For example, the penetration rate of E-mail rose from 67% in 1990 to 98% in 1991. Also increasing was voice mail, from 48% to 84%; LAN-based messaging, from 50% to 65%; EDI, from 28% to 42%; fax boards, from 15% to 49%; and LAN- or host-based fax servers and gateways, from 17% to 52%.

The companies surveyed say they will put an increased emphasis on taking the necessary steps to integrate these messaging

technologies because of the need for user support.

Specifically, respondents say they will place greater emphasis on purchasing X.400 and X.500 products and services, integrating fax and E-mail systems, increasing messaging API support, continuing LAN-based E-mail implementation growth, and installing work group and document management systems.

More than half of the respondents place the importance of various messaging or multimedia technology integration as high or very high.

“E-mail is evolving into a foundation for building enterprisewide multimedia highways.”



The capabilities requested most on the user wish list include access to a universal mailbox from anywhere, integration of graphics and images into E-mail, notification of fax and voice mail receipt via E-mail, retrieval of E-mail messages in multiple formats and integration of fax graphics into E-mail.

Open Systems Interconnection was listed as the most popular means of integrating messag-

(continued on page 24)

Reach unveils new MailMAN versions

Both desktop and portable releases offer new management features, five optional modules.

By Timothy O'Brien
West Coast Bureau Chief

SUNNYVALE, Calif. — Building on its strategy of providing client-based electronic mail software that works with leading messaging servers, Reach Software Corp. last week announced two new versions of its MailMAN product, including one designed for portable computers.

In the desktop version, MailMAN Version 2.0, Reach has added new mail management features, including a user interface, and five optional modules that provide mail archiving, mail sorting, spell checking, conferencing and a forms pack that includes standard forms.

In the portable version, called Personal MailMAN, Reach has included all the features of the desktop version, an off-line message management feature, the ability to access multiple servers to receive and forward mail as well as drivers for remote connections to a local-area network.

MailMAN, running at the desktop with Windows, supports No-

vell, Inc.'s Message Handling Service (MHS) engine and Banyan Systems, Inc.'s Mail on the server side.

Reach began delivering MailMAN Version 1.0 back in April of 1991. Since then, it has introduced WorkMAN, a work flow application that uses LAN-based E-mail as a transport mechanism.

Today's release of MailMAN ties the two products more closely together since the forms, routing and filtering capabilities of MailMAN are now compatible with WorkMAN. In addition, Personal MailMAN now makes it possible to incorporate work from users in the field into enterprise-wide work flow applications.

MailMAN 2.0's new user interface has streamlined the number of steps required to complete essential messaging functions such as addressing or attaching a file.

The new version also offers bi-directional support of Microsoft Corp.'s Dynamic Data Exchange, giving users the option to either launch MailMAN from other ap-

(continued on page 24)

EDI gets boost with new products, vendor alliances

SEATTLE — A bevy of new EDI products and services unveiled by GE Information Services (GEIS), Ameritech Information Systems, Texas Instruments, Inc. and MCI International, Inc. promise to give users new tools and broader platform support.

At the Electronic Data Interchange Association's 22nd National Conference here, GEIS announced several EDI products as well as an agreement to resell American Business Computer, Inc.'s Unix-based EDI software.

The new products include a host-based EDI translation and management tool called EDI Benchmark, which converts files into an EDI format without requiring user programming.

The company also announced MapMate, a personal computer-based tool that helps users build

maps that define the flow of EDI documents among multiple trading partners and lets them test the maps on the PC prior to incorporating them into a host production environment.

Both new tools are expected to be available in the third quarter of this year.

In addition, GEIS announced a new facsimile capability for its EDI Express service and a new accounts-payable feature for its Financial EDI service.

The new EDI Express-to-FAX service converts an EDI document to printed format, transmits the document to a trading partner's fax machine and provides an acknowledgment of delivery. The added accounts-payable capability allows a company using GEIS' Financial EDI service to pay

(continued on page 24)

Store & Forward

Recognizing the need to migrate its software to platforms other than mainframes, Dun & Bradstreet Software last week announced it has teamed with leading Unix vendors to port its terminal-based applications to Unix platforms.

Under the teaming agreements, Data General Corp., Digital Equipment Corp., Hewlett-Packard Co. and ICL PLC will assist Dun & Bradstreet Software in developing versions of its software for the various Unix platforms provided by each vendor.

No specific product or pricing details are available.

SBT Corp. announced the availability of a new version of its local-area network-based accounting system, SBT Professional Series 2.0. Included in the 150 new features of Version 2.0 are a new user interface, an on-line help facility, enhanced data integrity and modifiable source code.

Built around Fox Software, Inc.'s FoxPro 2.0 database, the SBT Professional Series takes advantage of FoxPro's ability to provide data access, storage and conversion.

Each module is \$1,295. ■

Reach unveils new MailMAN versions

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applications or launch other applications from MailMAN to view, edit or print attached files.

Version 2.0 of the software now supports five optional modules, including mail archiving, mail sorting and filtering, conferencing, which enables users to share mail with other users, and a spell checker. There is also a forms pack that provides a set of standard MailMAN-compatible

forms. Personal MailMAN provides users with support for remote communications and operations. Through drivers included with the software, Personal MailMAN allows users to pick up mail directly from public services, such as MCI Communications Corp.'s MCI Mail and CompuServe, Inc.'s CompuServe, as well as MHS and Banyan Mail.

The offering includes an off-line folder system and directory that allow users to create, manage, organize and store messages in folders so they can be sent when users are connected to the LAN. Personal

MailMAN can pick up all mail that has been stored on the LAN just by calling in remotely.

MailMAN 2.0 for MHS will be available in July. It costs \$995 per mail server for 25 users and \$2,995 per mail server for unlimited users. MailMAN for VINES will be out in June and priced at \$1,495 per server for unlimited users. Personal MailMAN is priced at \$149.

The modules will be rolled out during the next two quarters and will be priced from \$299 to \$399 per server for unlimited users. ■

EDI gets boost with products, alliances

continued from page 23

its vendors electronically.

The agreement with American Business Computer calls for GEIS to market world-wide American Business Computer's Unix-based EDI translator and EDI server programs, which are used for formatting and sharing EDI files. GEIS selected American Business Computer's software because of its Open Systems Interconnection architecture, installed base and ability to be integrated with other EDI systems.

Also at the show, Ameritech Information Systems announced a new Ameritech Information Exchange Management (AIEM) program and agreements to market EDI software from Supply Tech, Inc. and Blue Rainbow Software International Corp.

The first product in the Ameritech Information Systems program is the AIEM/Information Exchange Gateway, which is designed to support customized interactive information exchange applications as well as standard EDI transactions.

Also included is Supply Tech's PC- and mainframe-based software for formatting and sharing EDI documents.

In addition, Ameritech introduced AIEM/Assist, a new EDI consulting service.

Under the agreement with Blue Rainbow, Ameritech will distribute Blue Rainbow's EDI translation software, Multinet, for the IBM Application System/400 mid-range computer.

In another announcement at the show, MCI International said it will be marketing TI's mainframe-based EDI software, which works with MCI International's EDI 400 service.

The software includes EDI Translator, which formats transmissions for internal processing or shipping to a trading partner through a gateway. It also includes EDI Gateway, which performs the storage and routing of transmissions.

Also part of the agreement are plans to codevelop a PC EDI package scheduled for availability next year.

Further details on pricing and the release of the new products and services were unavailable. ■

E-mail key for new information highways

continued from page 23

ing technologies. Approximately 42% of the users plan to deploy X.400 connections between 1991 and 1993, while 38% say they will implement X.500 directories.

According to Rosall, the need for integrating E-mail with other key applications is becoming an increasingly important priority. She said E-mail's focus is now shifting to include more structured, application-specific activities.

For example, 77% of the respondents view the integration of E-mail with other applications as being a high or very high priority, up from only 45% in 1990. While 49% of the users plan to integrate E-mail with EDI, only 24% were ready to integrate E-mail with the less mature multimedia technologies of sound, text and video.

For more information or copies of the report, contact IDC at (508) 935-4389. ■

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INDUSTRY UPDATE

VENDOR STRATEGIES, MARKET TRENDS, ALLIANCES AND FINANCIALS

Worth Noting

“SunNet Manager will operate in the Open Software Foundation [Inc.’s] Distributed Management Environment, but what that means will depend on what the DME looks like when it comes out.”

Denis Yaro
Director of network management
SunConnect
Mountain View, Calif.

Vendors test MMS-based wares for interoperability

Efforts to spur use of the manufacturing protocol.

By Ellen Messmer
Washington Correspondent

STERLING HEIGHTS, Mich. — Vendors of Manufacturing Message Specification (MMS) products for the first time have tested their wares for interoperability using the Basic Functional Test (BFT) suite.

The BFT suite is the first set of common interoperability tests developed for products based on MMS, an Open Systems Interconnection application-level protocol intended to ensure compatibility of programs used on the factory floor. However, problems with MMS interoperability have slowed deployment of the protocol.

Last week, MMS vendors Alan-Bradley Co., Cycle Software, Inc., Systems Integration Specialists Company, Inc. (SISCO), Germany’s Fraunhofer Institute as well as Martin Marietta Corp., which developed its own MMS-based robot-control application, participated in the BFT tests at SISCO here, according to Ralph Mackiewicz, SISCO’s vice-president of sales and marketing.

Mackiewicz said the test results will be evaluated at the OSI

Workshop MMS Special Interest Group meeting early next month at the National Institute of Standards and Technology. The Special Interest Group created the BFT test suite.

If BFT checks out as a viable test suite, vendors will conduct a round of more formal tests to establish an interoperability certification system in which tested products would be listed on the OSINET database maintained by the Corporation for Open Systems International.

The lack of interoperability tests has forced users to trial products in-house and stifled demand for MMS products. General Motors Corp., a user of client/server-based MMS factory-floor applications, has been forced to perform its own extensive interoperability testing and debugging of MMS products.

“We’re concerned that products haven’t gone through rigorous conformance and interoperability testing,” said Gary Workman, staff development engineer with GM’s Manufacturing Automation Protocol advanced engineering staff. “It’s a burden on *(continued on page 28)*



“We are at a point where LAN internetworking is a significant source of traffic and one that needs to be more effectively integrated into a wide-area network.”

John Lockitt
President and chief executive officer
Motorola Codex

Codex readies LAN internetwork push

Insiders say company will launch by year end a new line of fast packet switches for LAN traffic.

By Jim Duffy
Senior Editor

MANSFIELD, Mass. — Modem kingpin Motorola Codex is readying an assault on the LAN internet market, a thrust that many argue is long overdue and that some contend may be too late.

Analysts and former Motorola Codex employees say the company will unveil later this year a family of internally developed fast packet T-1 and T-3 switches that will support time-division multiplexing, frame relay and, in a later release, cell relay and Asynchronous Transfer Mode.

Although he declined to comment on those reports, John Lockitt, president and chief executive officer, said, “We have a plan — a strategy — to address the internetworking of local-area network traffic.” He added that customers will begin to see these products this year.

It is unclear if the first release of these switches will support routing, but sources believe that capability will ultimately be added. Motorola Codex currently resells Proteon, Inc. routers for systems integration projects, and many believe the modem giant will license Proteon technology for the switches.

Despite the fact that Motorola Codex’s plans are still sketchy, it is clear that demand for the company’s bread-and-butter high-speed modems is diminishing. Corporate networks are increasingly based on sophisticated digital network access and routing devices used to build wide-area

LAN internets.

As a result, the modem market is drying up. According to market researcher Dataquest, Inc. of San Jose, Calif., the market for dial-up and leased-line modems will decrease from \$931 million in 1991 to \$367 million in 1995.

Recognizing that trend, the company has been diversifying, an effort that has come at some expense. Although Motorola, Inc. does not break out financials by company unit, according to former staffers, Motorola Codex has been losing money for the last three or four years. One former official said the firm lost \$40 million in 1991.

Company watchers say the losses stem from waning demand for modems and the cost of funding new business ventures.

Lockitt said the last three or four years were periods of “heavy investment.” And he noted that network access products and devices such as multiplexers, X.25 switches, packet assembler/disassemblers and LAN bridges now account for the lion’s share of Motorola Codex’s revenue. Four or five years ago, transmission equipment was the dominant revenue producer.

That product mix may change more dramatically with the company’s new LAN internet push.

“I’ve been told by Codex that they’re anticipating LAN internetworking as the future of the corporation and that it has to succeed for the company to be successful,” said Dick Drollinger, di- *(continued on page 28)*

INDUSTRY BRIEFS

DG-Uniplex partnership to release Medley. Data General Corp. last week announced a strategic partnership with software supplier Uniplex, Ltd. of Hempstead, England, to develop client/server office automation software for DG’s AViiON computer line.

The Medley line of software will comprise a range of applications that provide network services such as distributed document management and file conversion. Medley for AViiON will run on any personal computer or Unix client in AViiON server-based client/server environments. The software will be available by the first half of 1993.

Int’l wireless data group opens membership. Five international companies involved in wireless data communications have announced the formation of the Worldwide Wireless Data Network Operators Group to back the use of Motorola, Inc.’s RDLAP and MDC4800 wireless protocols.

The five firms are ARDIS Co., Bell-Ardis, Deutsche Bundespost Telekom, Hutchison Mobile Data, Ltd. in the U.K. and Hutchison Mobile Data, Ltd. of Hong Kong.

Each group member has selected Motorola’s packet data protocols as their network standard.

The group is inviting other vendors interested in using the Motorola protocols to join. ■

People & Positions

Proteon, Inc., a Westborough, Mass., maker of hubs, routers and network adapter cards, has announced the appointment of **Alice Bradie** to the company’s board of directors.

Bradie, who became an independent advisor to the data communications industry in January, previously was a principal specializing in communications technologies at the investment firm of Hambrecht & Quist, Inc. in New York.

Lotus Development Corp. has consolidated management of its development efforts in order to better meet the company’s short- and long-term product development objectives.

John Landry, senior vice-president of development and chief technology officer, along with **June Rokoff**, senior vice-president of development, will comanage the development organization of the company.

Previously, Rokoff held the position of senior vice-president of the firm’s consulting and information services group. ■



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Vendors test wares for interoperability

continued from page 25

my company. The products that are available aren't interoperable. We spend an inordinate amount of time to get our applications working." Workman noted that the testing problems associated with MMS will cause small companies without lab resources to shy away from the ISO 9506 MMS standard for factory automation.

BFT is not a conformance test, which comprehensively tests a product for adher-

ence to a standard. Rather, the BFT suite determines the status of an MMS device when it is working with another product under a defined set of conditions.

But conformance testing, which increases the likelihood that products will interoperate, also remains a troubling issue for MMS. To date, only the Fraunhofer Institute has developed a conformance test for MMS, but it has been called inadequate. Workman said Fraunhofer is expected to release an upgraded version of the test suite soon and may put the abstract test suite in the public domain. **Z**

Codex readies LAN internetwork push

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rector of system services at Summit Information Services Corp. in Corvallis, Ore.

Some charge, however, that it is too late to be entering the market, with powerhouses such as Cisco Systems, Inc., Network Systems Corp. and Wellfleet Communications, Inc. already firmly entrenched (see graphic, page 25).

"They've been kind of standing still while everyone else has been passing them by," said Charles Robbins, director of com-

munication research at Aberdeen Group, Inc. in Boston and a former Motorola Codex employee. "They're kind of in a time warp."

Curtis Price, an analyst at International Data Corp. in Framingham, Mass., and another ex-Motorola Codex employee, added, "To think that they're just now making statements of LAN internetworking makes you think that they're late. They're slow to react to market changes."

Early efforts

Lockitt said Motorola Codex first recognized the LAN internetworking market in the mid-1980s, but he acknowledged that his company did not address the market until late in the decade.

The company's first LAN internetworking product, the 6310 EtherSpan Ethernet Bridge, emerged in 1990. At that time, however, users were already looking beyond dedicated LAN bridges to multiprotocol routers.

Lockitt said he believes the company's timing is not due to management inertia but rather to opportunity and the time it takes for a half-billion-dollar company to undergo a product and marketing metamorphosis.

"We are not a small start-up company that is focused on [LAN internetworking]," Lockitt said. "We are at a point where LAN internetworking is a significant source of traffic and one that needs to be more effectively integrated into a wide-area network."

But even if the timing is right, the evolutionary process is turning out to be slow and painful.

Last December, Motorola Codex eliminated 400 positions in an effort to retrench and focus on LAN internetworking and network access products. During the past year, the company has watched executives such as John Thibault, senior vice-president, and Robert Stearns, vice-president of corporate marketing, as well as a slew of technical staffers, walk out the door.

Thibault and Stearns declined to be interviewed for this story. But some former employees said they were frustrated with the snail-like pace of the company's evolution and lack of confidence in its viability in LAN internetworking.

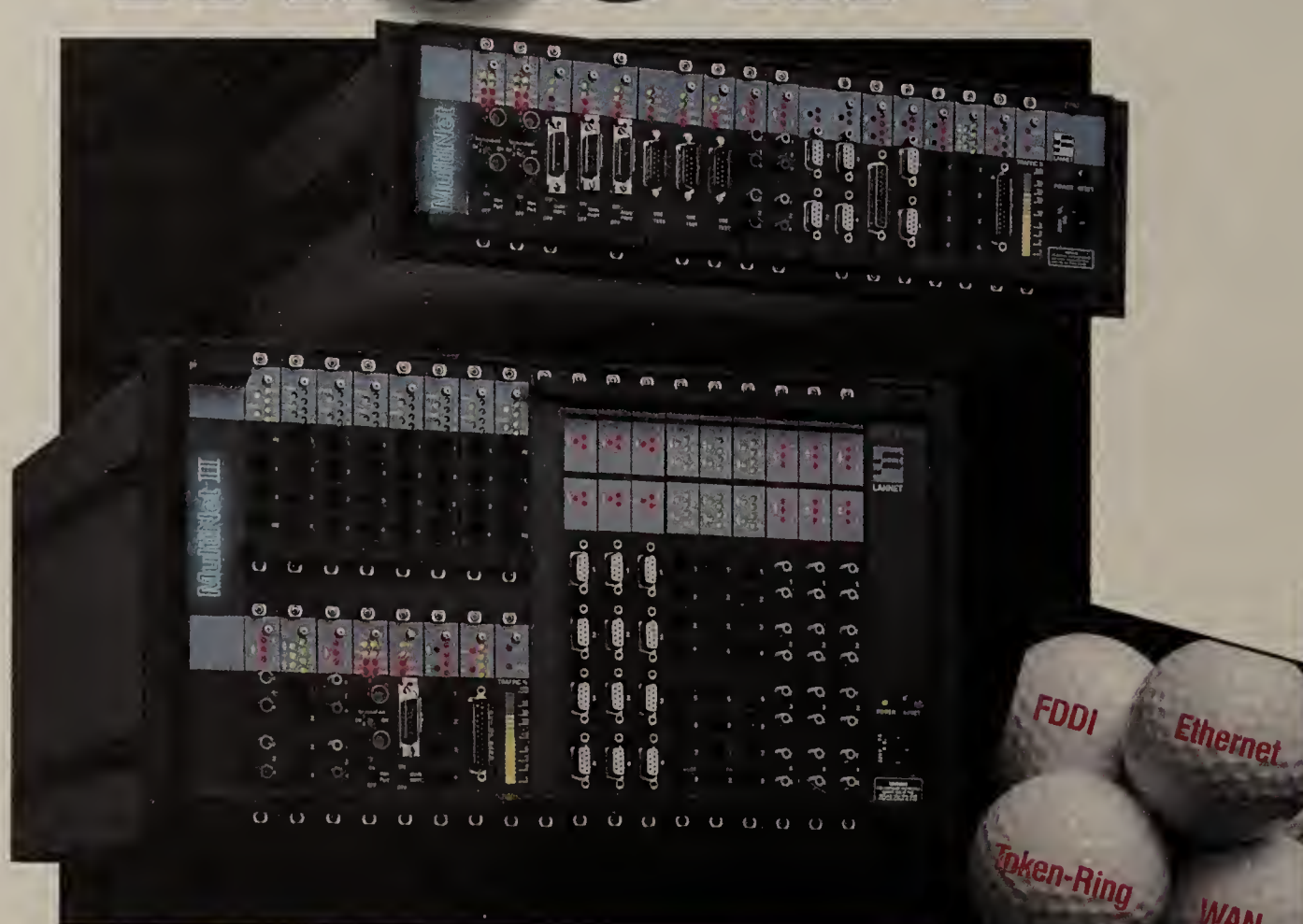
Thibault left Motorola Codex to become president and CEO of Coral Network Corp., a Marlborough, Mass., maker of broadband network switches for LAN internetworking.

Motorola Codex customers believe the company can succeed in LAN internetworking if it gains a clear understanding of their needs and produces innovative products that will allow them to take advantage of new carrier services.

"If they make the right decisions right now, if they take a step back, understand what the industry is doing and get back in again, [they have a chance to succeed in LAN internetworking]," said Henry Thayer, director of data communications at Blue Cross & Blue Shield of Rhode Island. "They've got to understand what the regional Bell operating companies and interexchange carriers are doing and where networking is going in this country." **Z**

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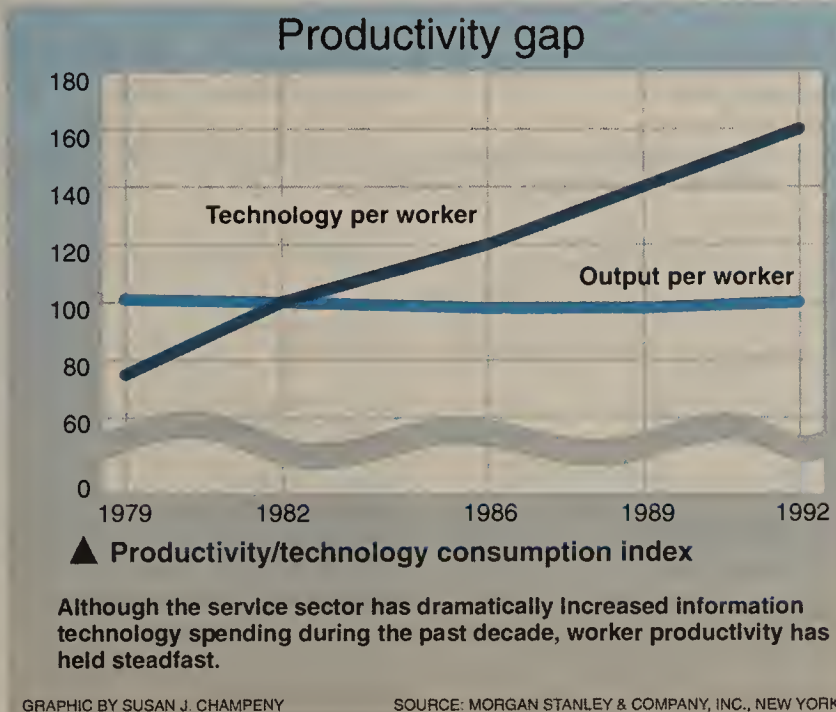
MANAGEMENT STRATEGIES

ENTERPRISE NETWORK STRATEGIES, USER GROUPS AND MANAGING PEOPLE AND TECHNOLOGY

Worth Noting

“There is no easy way to justify an investment in open systems.”

Sally Atkins
Consultant
Technology Directions
and Research
John Hancock
Financial Services
Boston



IS spending fails to increase productivity

Service firms restructuring IS systems through consolidation for a greater productivity payback.

By Wayne Eckerson
Senior Editor

NEW YORK — According to some observers, corporate America is littered with high-priced, sophisticated information systems (IS) that do little to improve worker productivity.

This technology paradox is most evident in the U.S. service sector, which during the past 10 years has spent \$862 billion on information technology. This comprises 85% of the total information technology purchases made in the U.S., according to analyst Stephen Roache of Morgan Stanley & Company, Inc. here.

Even though service companies have increased IS spending per worker by about 60% since 1982, these expenditures have failed to deliver any gains in worker productivity, Roach said (see graphic, this page). Service companies equip each white-collar worker with an average of \$10,000 of information technology.

“There is no reason why the typical service worker needs such an inordinate amount of information technology to perform a white-collar function,” Roach

wrote in a recent Morgan Stanley research bulletin.

“Long shielded from the pressures of global competition, service companies [have] moved with reckless abandon to acquire the latest in hot new technology products — facing little pressure to justify such investments in terms of their measurable productivity paybacks,” Roach said.

Back-office systems

In the face of heightened global competition, many service companies are now beginning to restructure IS to achieve a greater productivity payback. For example, the megamergers in the banking industry have led banks to consolidate redundant back-office systems, Roach said.

“Bank back-office consolidations have allowed service companies to begin substituting high tech capital for high-cost white-collar labor,” he said. Roach said that such restructuring will cause many workers to lose their jobs.

He said that, in the coming years, service companies will demand tighter linkage between technology expenditures and productivity gains. ■

Manager Minutes

The Data Interchange Standards Association (DISA) recently presented Clifford Buys with the 1992 EDI Professional Award for distinguished leadership and service in the field of electronic data interchange.

As director of management systems for the American Trucking Association, he played an instrumental role in establishing EDI standards for shipping documents in the transportation industry.

Buys currently serves as president of the Data Interchange Standards Education & Research Foundation and as DISA's corporate secretary. DISA is the administrative arm of the Accredited Standards Committee X12 that develops EDI standards.

The Wall Street Telecommunications Association (WSTA) will host on Thursday a half-day educational session on vide Conferencing.

The session, which is being sponsored by Sprint Corp., will be held at the New York Marriott Financial Center from 8:30 a.m. to 11:20 a.m.

The session features presentations by Tina Mayland, vice-president of Sprint's Video Group, and Mike Mullen, director of Northeast sales for Videotelecom Corp.

For more information, call (908) 204-0863. ■

Federal Express uses EDI to streamline its billing

COEP cuts time, cost of tracking remittances.

By Wayne Eckerson
Senior Editor

MEMPHIS, Tenn. — Federal Express Corp. has implemented an electronic payment system that is helping the overnight courier streamline remittance tracking and customer payment processing.

The host-based system, which has been integrated with Federal Express' accounts receivable system, enables customers to pay invoices electronically using electronic data interchange. It has also helped the company reduce costs as well as increase productivity.

The system, called Customer Originated Electronic Payments (COEP), was developed by GE Information Services (GEIS) for its parent company General Electric Co., which uses the product to electronically collect and process more than \$20 billion worth of revenue annually. GEIS began marketing the product externally last year.

Popularity growing

Federal Express already has 60 customers participating in the electronic remittance program, representing about 4,000 payments a day. The company hopes to add most of its largest trading partners to the program during the next two to three years, according to Tom McNeal, managing director of the firm's U.S. remittance operations, here.

“[Electronic payments] is the

wave of the future,” McNeal said. “It has helped us reduce costs, update remittances more quickly and reduce errors caused by manual data entry.”

Federal Express currently employs 250 clerks to process about 56,200 checks it receives each day. The checks are payments for the 1.6 million packages the company delivers daily.

The clerks match checks to outstanding invoices and update customer files in an accounts receivable system running on a mainframe here.

Timesaving

Sometimes one check from a large customer can represent payment for 1,000 or more bills, making the process of tracking and verifying remittances extremely time-consuming, according to company officials.

With COEP, customers use GEIS' EDI*Express network to send electronic remittances to Federal Express and electronic payments to Federal Express' bank. The bank credits Federal Express' account for the amount indicated in the electronic remittance. COEP also gives the firm's customers the option of sending checks instead of electronic payments.

COEP automatically processes incoming electronic remittances and payments, and updates customer accounts in Federal Express' host-based accounts receivable system. ■

EXECUTIVE BRIEFS

A lease for every nation. Comdisco, Inc. recently created a global lease agreement that makes it easier and less costly for companies to lease equipment in other countries. The Global Master Rental Agreement (GMRA) took 18 months to develop and contains general terms and conditions that are accepted worldwide, according to company officials.

So far, 30 companies are using the GMRA, including Avon Products, Inc., GTE Corp. and Halliburton Co. For more information, call (708) 698-3000.

Ten hottest technologies. INFOMART recently released a list of the top 10 technologies and services about which customers most frequently request information. The technologies are image processing, network systems, custom software applications, telecommunications, computer-aided software engineering, executive information systems, electronic data interchange, database management systems, office automation and outsourcing.

INFOMART, located in Dallas, showcases the potential of information technology through permanent exhibits that demonstrate industry-specific applications and vendor products. ■

OPINIONS

MANAGEMENT ISSUES

BY ELLEN FERLAZZO

The fine art of network troubleshooting

What makes a good network troubleshooter? We all know what makes a bad one, or rather, we know the frustration of dealing with one when we're trying to find a solution or at least a cause for our problem. But what skills are needed to troubleshoot a network competently?

Obviously, a certain amount of technical know-how about the network is essential. Yet I've seen very knowledgeable, technically competent people make lousy troubleshooters. Troubleshooting is an elusive skill, hard to describe, hard to teach, but very valuable.

Too often, there is too much emphasis placed on good phone manners and good customer service, but very little

attention paid to troubleshooting skills. Phone manners are easy to teach; troubleshooting skills are not.

The first part of teaching is to identify the skills the student should have at the end of the course. There are several basic skills someone should have when graduating from Network Troubleshooting 101.

First, a good network troubleshooter should be willing to believe something actually happened.

How many times have you told someone what you experienced, only to have them say, "That's impossible. The network doesn't work that way." This is often the problem in dealing with the more technically competent people. They know so much, they think they know everything. And given the almost infinite combinations of network equipment, distributed applications and operating system environments, no one knows it all. What the good network troubleshooter does in this situation is simply ask questions to get the "witness" to describe what happened in such a way as to make the unbelievable believable.

Second, a willingness to attempt to figure out the problem, rather than shifting blame and pointing fingers, is essential. This partly comes under good user relations but is part of network troubleshooting, also. If supposed troubleshooters are unwilling to admit that the network may be part of a problem, they're not likely to find a solution.

Also essential is the ability to jump to good conclusions. Good network troubleshooters jump to likely conclusions, based on experience with similar problems and gut reactions. Bad ones jump to bad conclusions and are often unwilling to admit they even jumped.

Compounding this necessary skill is the problem of generally good troubleshooters getting into the habit of jumping to the same conclusions over and over. You have to listen to the problem and see whether this network problem warrants the jump or not.

Last but not least, a good network troubleshooter should never forget the basics. Every now and then, there really is someone who hasn't turned the power switch on. A class on basic phone manners will teach you how to handle those situations without being insulting. ■

Ferlazzo is a former information services manager now working as a free-lance writer in Pleasanton, Calif.

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EDITORIAL

Frame relay implementations put users to the test

Back in October 1990, *Network World* served up a three-part series of articles investigating frame relay and its impact on user networks. At the time, vendors trumpeted the simplicity of frame relay over other packet-based services.

"It's a lot like X.25, but it's simpler by about an order of 10," said Brian Button, StrataCom, Inc.'s product manager for packet mode services.

Now, about 18 months later, frame relay is still perceived as an uncomplicated way of gaining maximum data transmission efficiency from a packet net. However, this week's premier Frame Relay Test Series article, which begins on page 35, indicates that users may find implementation of frame relay prod-

ucts and services more complex than they anticipated.

The Frame Relay Test Series, conducted for *Network World* by AT&T Bell Laboratories along with test equipment makers Telenex Corp. and Wandel & Goltermann Technologies, Inc., concludes that users are likely to find it difficult to link routers to certain carriers' frame relay services. It goes on to say users may also discover incompatibilities between frame relay interfaces, making it difficult to get various brands of equipment, such as local-area network routers, to work with one another.

The reason seems to be that, although vendors have adhered to the loosely defined frame relay standard, they have each implemented their own interpreta-

tion. If an equipment vendor's frame relay implementation deviates slightly from a carrier's, users may have to fine-tune their premises gear.

The problem is reminiscent of the Open Systems Interconnection movement, in which users have encountered similar interoperability problems due to different implementations of the OSI standard.

To their credit, frame relay vendors are trying to resolve the issue. Members of the Frame Relay Forum are lobbying to devise and adopt a single frame relay implementation.

We encourage vendors and service providers to do so, thereby assuring users that frame relay is as simple as it's cracked up to be. ■

OPINIONS

EMERGING TECHNOLOGIES

BY MARY JOHNSTON TURNER

Fast-changing CPE landscape may benefit net managers

In the next few years, networks, computers and consumer electronics will merge to create a new generation of user-friendly customer premises equipment and more flexible customized network services.

Network managers must begin now to track this merger and work with their business divisions to determine how best to leverage the changes that will result. Otherwise, they risk being left in the dust of those companies that are more aggressive and forward-thinking.

If your business is information-oriented and targets mass markets, this merger will have a dramatic impact on how your company does business.

As a result, your company is likely to find itself relying on new service delivery channels such as telephone company, cable television and wireless services. These new channels will not just be used for order entry, but also for product advertising, market development, customer service and customer training, sales support and delivery of services.

In essence, these changes will redefine the corporate network by extending it right into the customer's home, small business workplace, sales representative's car and middleman's warehouse.

Line managers — the mid-level managers in charge of day-to-day functions — are probably unaware of these impending changes. Helping line managers gain a competitive edge by understanding what will happen and developing strategic plans may be the most important thing network managers can do for their companies in the near future.

As part of the merger of the consumer electronics, computer and network industries, net managers can expect to see

many nontraditional alliances among industry players. Consumer electronics companies such as Sony Corp. may team with computer vendors such as Apple Computer, Inc. to produce next-generation premises equipment, touch screens, high-definition graphics and user-friendly, stylus-based interfaces for the consumer and small business markets.

Alliances between chip manufacturers and television set

The result of the new alliances will be truly ubiquitous computing.



vendors will result in products that contain sophisticated, workstation-quality chips, leading to "infotainment" centers that supply voice, data and video to the home. This type of easy-to-use "smart" TVs will help to drive acceptance of multimedia applications that are much more attractive and sophisticated than videotex.

Telephone companies will respond to this new equipment by redefining the role of the public network, offering flexible, user-controlled voice, data and video interfaces to a wide variety of information content providers, ranging from Time-Warner, Inc. to the Library of Congress. Telephone companies bring to this new role their traditional strengths — usage-based billing and the ability to supply mass market services.

These new technologies and vendor alliances will have an impact on the traditional private

network as well. Network managers are likely to see a shift in the mix of vendors they turn to for solving communications problems. Businesses looking to improve customer service and drive inefficiency out of business processes will find they must rethink what kind of equipment belongs on the corporate desktop — especially if that "desktop" is in the car or the customer's living room.

In addition, work flows will have to be reconsidered. Employees will be required to do more direct data input. Even customers may be allowed more user-friendly access to a company's internal networks or selected databases. Perhaps many customer service operations will become self-serve.

Because a company's networks will reach directly into customer homes and businesses, security will be increasingly important. In addition, remote network management to support customers, suppliers and mobile workers will be critical.

The low-cost computing and information access brought about by these changes will force all types of businesses to extend their electronic links to a much wider and more mobile customer base, including the home. Telephone companies will no longer be the only means of attaining these links.

Those companies that figure out how to leverage the changes that result from the merger of the computer, network and consumer electronics industries are likely to find significant competitive advantage in the latter half of the 1990s. ■

Turner is a principal with Northeast Consulting Resources, Inc., a Boston consulting firm that focuses on strategic management and information technologies.

TELETOONS

BY FRANK AND TROISE

The Network Manager's Handbook: RULE 15

Encourage users of videoconferencing to use a range of expressive options so as to avoid confusion or monotony during presentations.



LETTERS

Congestion solutions

I appreciated your recent article on network congestion by Wayne Eckerson ("Net mgmt. traffic can sap net performance," NW, May 4). We at Westronic Systems are watching this network loading issue closely, and it's interesting to know that some of the same issues we see in the public arena are appearing in the local-area network arena, as well.

Public telecommunications standards are moving toward autonomous reporting and away from polled protocols. In the U.S., for instance, three main polled protocols are used for remote telemetry and equipment surveillance. Telemetry Bit Oriented Serial (TBOS) is the standard serialized interface for connecting network elements, such as fiber-optic multiplexers and microwave radio systems, to telemetry hubs.

Another polled protocol often encountered is Telemetry Asynchronous Block Serial (TABS), which also feeds a te-

lemetry hub. That hub is then polled by the network management host system using the E-Telemetry protocol.

All three protocols — TBOS, TABS and E-Telemetry — use a bit map of alarm and status points, with each bit indicating the state of a particular function, circuit or subsystem.

The new standard maintained by Bell Communications Research, called Transaction Language 1 (TL/1), is an ASCII message-based protocol. TL/1 supports autonomous reporting of alarms and events from the network element to the host system via X.25. There are also options whereby a collection of

(continued on page 39)

Network World welcomes letters from its readers.

Letters should be typed and double-spaced. Mail them to Editor, Network World, 161 Worcester Road, Framingham, Mass. 01701.

Letters may be edited for space and clarity.

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If you have an idea for an Alligator article, call Susan Collins, associate features editor, at (508) 820-7413 or fax your idea to us at (508) 820-3467.

Footing the bill

New delivery options, consolidated billing and reporting, other innovations make combing through bills easier for net managers.

By DANIEL BRIERE
and CHRIS FINN

Just a few years ago, when customers wanted to give their long-distance carrier representatives a good scare, they would talk about systemwide billing errors and long delays in getting calls to show up on their bills.

Today, most carrier sales representatives tackle the subject head-on. They pull out brochures explaining how billing data can be provided on a slew of alternatives to paper ranging from CDROM to electronic mail. Some even demonstrate personal computer-based software that enables users to tap carrier-provided call detail information and produce customized reports.

Interexchange carriers have indeed come a long way in meeting customer demands for more accurate, complete and consolidated billing and reporting. Carriers have installed new billing system infrastructures in an attempt to consolidate bills for several services on a single invoice and provide users with more detailed call and traffic reporting information. They've even attempted to streamline their billing processes by listening to user input.

Looks are everything

While the pros and cons of each carrier's underlying billing infrastructure can be debated, what matters most is what the customer can get.

"I don't care how the carrier creates the bill for me," says Peter Boyle, telecommunications manager for Hoffmann-La Roche, Inc. in Nutley, N.J. "What I do want is an accurate bill on time and in the format I want."

High on the list of customer requests are cross-service and cross-location billing options, which offer a look at usage for all services across all sites concentrated on a single bill.

Users no longer want a mountain of bills, each one listing usage for a single service at a single site.

"Having consolidated billing and reporting is a must if you are going to even start to deal with managing your monthly long-distance bill," says Barbara Anderson, personnel administrator at Quincy Compressor, a division of Coltec Industries, Inc. in Quincy, Ill. Consolidated billing is essential for customers trying to optimize their service mix — weighing private-line services against frame relay, for example.

Customers can now construct billing and reporting structures with as many as nine hierarchical levels and flexible invoicing points. A level in this system represents an organizational layer consisting of one or more sites. A typical three-level customer hierarchy might include a single headquarters site at the top, multiple regional sites on the next level and multiple local offices at the bottom.

An invoicing point simply refers to who pays the bill for which type of usage. In most companies, the invoicing point is the headquarters location, where bills are paid for everyone in the company.

Customers might also have certain bills and reports going to different levels.

In a two-division company, for instance, one division might have bills sent to the lowest level, say a department, while the other division may simply have all bills sent to headquarters. But in both divisions, reports — particularly extra copies of call detail reports — would be sent to multiple levels throughout the organization.

Tackling the task

All three major interexchange carriers — AT&T, MCI Communications Corp. and Sprint Corp. — have made some headway in providing consolidated and flexible hierarchical billing for a select range of services, particularly the high-end services, but each has limitations when it comes to covering a broad range of services.

AT&T has the hardest time attaining this "higher plane" of billing due to the large number of systems it uses to generate bills. Overall, AT&T questions the demand for consolidated billing and reporting, claiming that the need is concentrated among larger customers.

Software-Defined Network customers can have as many as nine levels of billing

hierarchy, while inbound service customers get a bill listing only the charges incurred for all locations with no hierarchical billing. To achieve hierarchical location-level billing for inbound services, AT&T must set up an account for each location.

AT&T has very little to offer the average corporate customer when it comes to consolidated billing. AT&T will consolidate billing and reporting on an individual-case basis through customized reporting. The cost of this depends on the size of the user company and the number of services it uses.

AT&T offers customized consolidated inbound, outbound and private-line billing and reporting through its Virtual Telecommunications Network Service (VTNS) covered by Tariff 12, which is designed for AT&T's largest users. AT&T is developing a portfolio of standard management reports for Tariff 12 users.

MCI has been able to avoid many of the problems AT&T has encountered in trying to reduce the number of billing systems it uses. MCI offers the Portfolio consolidated reporting option, which can combine billing information for 15 ser-



vices, including MCI's Virtual Network (Vnet), 800 and Digital Private Line Service, in a single report. MCI intends to add its remaining services to Portfolio over the next few years.

The reports generated by Portfolio are not bills. They summarize the call detail and other information found on the actual bill for each service. Thus, MCI's Portfolio system relies on data created by the underlying systems to create bills for each service.

The Portfolio system collects information from each of those service's specific billing systems. Because each service is on a different billing cycle, Portfolio reports can lag as much as 45 days behind the close of a particular service's billing cycle.

Sprint has the optimal solution for consolidated and hierarchical billing, at least as far as architectures are concerned.

Massive systemwide problems in the mid-1980s caused many customers to drop Sprint service. But a corporate mandate to resolve the problems resulted in the development of a number of new billing processes, culminating in the rollout of Sprint's Invoice Processing System (IPS) in 1990. IPS is the only standardized cross-service billing platform among the top three carriers, but it does not yet include every Sprint service.

Most of Sprint's billing is handled by IPS, making consolidated reporting available across services and locations.

For the majority of its customers, Sprint offers its Management Billing Advantage (MBA) invoice, which combines inbound and outbound services on a single invoice. Although Sprint's Virtual Private Network (VPN) is not currently included on the MBA invoice, Sprint will start migrating VPN customers to IPS billing next year. Sprint is currently migrating those customers with standardized billing requirements to the IPS system.

For VPN customers requiring customization or with very large amounts of traffic, Sprint will continue to use its National Accounts Division (NAD) Biller in Atlanta and its Customized Billing Center in Sacramento, Calif.

"Sprint set up the billing hierarchy the way we wanted, and we have not had any major problems," says Bob Matheson, director of telecommunications for the department store division of the Dayton-Hudson Corp. Matheson, who is billed by NAD, adds that any billing issues resulting from the customization were "quickly resolved."

Spare the trees

One motivating factor behind these consolidated reports has been the sheer amount of paper involved in a telephone bill. For the average business customer, phone bills can be measured in feet, not inches. Sifting through mountains of paper-based call detail records can be a waste of a network manager's time.

Therefore, carriers are exploring different ways to present customer information. Dial-up access, magnetic tape, diskettes, cassettes, microfiche, scheduled file transfer, electronic data interchange, E-mail and CDROM are all available or in testing as billing media for a broad range of services. (The chart on page 34 shows which media each carrier uses for delivering information to customers.)

Magnetic tape is a tried-and-true medium for delivery of call detail information. Carriers have sought to increase the level of information included in the tapes. Sprint, for instance, offers its Information Detail Tape, which comprises call detail for completed and incomplete calls, as well as invoice summary information including all charges and credits shown on the bill.

Covering all Sprint products billed by IPS, it is available in place of the one free copy of call detail information allotted to Sprint customers or as an extra-cost telemanagement report.

With AT&T's Call Detail Tape, available with SDN and VTNS, customers get a list of all attempted and billed calls, which enables the network manager to engineer trunk size on the network more precisely and track calls not getting onto the network.

These recent improvements in tape delivery services have made it easier for customers to cull call detail information from tapes. But new media options could displace tapes. The two new options holding the most promise are delivery of summary and detail information via EDI and delivery of call data via CDROM, both of which can be used with flexible PC-based reporting software.

EDI's promise is bolstered by ANSI's X12 811 version of the EDI standard, which includes fields for call detail information that allows a greater amount of data to be sent electronically. However, EDI still has a long way to go before it can provide the range of information offered by tapes.

In addition, EDI differs from carrier to carrier. For example, AT&T will support different services using EDI, but each service requires a separate EDI transmission. Sprint, on the other hand, will send all of a customer's data in one EDI transmission.

CDROM, a more permanent, more reliable and higher capacity storage medium than diskettes, is another up-and-coming means for call detail delivery.

Customers looking to load traffic information onto high-powered PCs have used diskettes in the past, but even with data compression, one month's data could take between 20 and 30 diskettes. So far, MCI is the only carrier offering CDROM delivery.

PC report generators

Diskettes and CDROM are both only delivery mechanisms. The carriers are

also taking a big step forward in addressing the requests for customized billing.

Off-the-shelf PC-based software such as MCI's Perspective, AT&T's Detail Manager and Sprint's FONView allow telecommunications managers and nontelecommunications staff to create different reports, complete with graphics, for different groups.

AT&T has recently enhanced its inbound and outbound Detail Manager packages by adding reports and graphics and by offering reporting that spans its new Optima and Gold service families. Detail Manager is not available for SDN users but is available for high-volume Megacom WATS and Megacom 800 services customers.

Detail Manager uses diskettes as its delivery medium, with 500,000 minutes of traffic per month as the current practical limit for the service. About 20,000 call records fit on a single diskette.

Since 1989, Sprint has offered FONView, which provides graphical presentation of data and has a 12-month rolling history of data.

FONView has 18 standard reports plus a refined ad hoc report-generating function that allows users to produce virtually any variation of a report. As many as 50,000 call records fit on a diskette. It also supports delivery of data via SprintMail, the carrier's E-mail service.

FONView enables network managers to rebill traffic to end users at a percentage above the Sprint rate, which is ideal for centralized management groups that have to bill individual departments. This year, Sprint also plans to expand FONView to include multiple services on one set of diskettes.

MCI's Perspective has many sophisticated graphical capabilities, including the ability to construct pie charts and bar graphs. MCI actively markets call data delivery via its MCI Mail service and was the first carrier to beta test call data delivery via CDROM. That beta test, conducted with 50 large MCI Vnet users, was successful, and MCI said it will make CDROM data delivery available in controlled release.

Perspective is generally available only for MCI's mid-level Vision product. The carrier expects to add Vnet and Portfolio under Perspective later this year or early next year.

"It's quite a product," says Jay Noonan, communications manager for the city of Wilmington, Del., and an original Perspective beta tester. "MCI has continually revised the software to better handle large accounts."

He notes that specific upgrades he had sought included increasing the modem speed from 2,400 to 9.6K bit/sec and quicker data processing times.

Another networking tool, the network

management terminals also allow users to manage systems and services.

Originally used for network monitoring and limited network control, net management systems today are offering a broad range of call reporting functions. From network management terminals, users can tap into financial, traffic, configuration, trouble and performance data stored on carrier hosts.

For example, AT&T offers the Service Monitor element management system, which supports advanced reporting on incompleting calls to an 800 number.

With reports available on a daily, weekly or monthly basis, or when certain conditions or parameters have been met, Service Monitor shows the user eight different classifications of incomplete calls, ranging from network busies to ring/no answers.

From this information, a user can determine exactly how many calls are not being completed and whether the limitation is a result of the network, customer premises equipment or internal staffing.

Neither MCI nor Sprint offers this capability through its network management interface, although to some degree both offer paper-based reporting on the topic.

MCI addresses this need with a listing of incomplete calls on every 800 user's bill. MCI customers cannot get this information through a network management interface.

Sprint also offers low-cost telemanagement reports, which aid in traffic analysis.

Large Sprint customers can request a great degree of customization.

Overall, users can expect a growing reclassification of network management terminals from simple network monitoring and device control systems into delivery mechanisms for a wealth of invoice and noninvoice reporting.

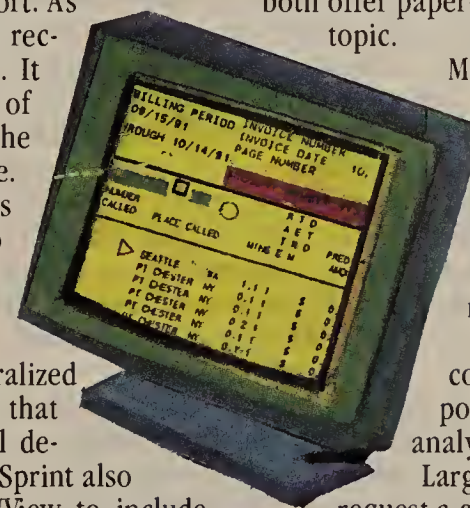
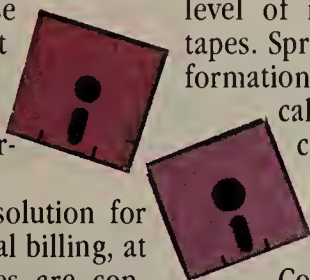
What's under the hood?

The carriers have certainly not put all their billing problems behind them, but their efforts over the past few years to minimize billing nightmares are paying off.

The key is in the underlying architectural foundation of each carrier's billing system. Each has a different philosophy regarding billing system architecture.

MCI offers consolidated billing, while Sprint and AT&T have more of a focus on integrated billing. The difference between an integrated and a consolidated system lies in the fact that an integrated system is the primary billing platform for multiple services, while a consolidated system culls data from service-specific billing systems.

(continued on page 34)



(continued from page 33)

Forward thinking in the 1980s put MCI at the front of the pack in the early 1990s. MCI has a clearly defined billing strategy.

Unlike AT&T, MCI has focused a great deal of effort on consolidating its reporting. "Some customers want consolidated invoicing, and some don't," says William Kyburz, MCI's manager of electronic billing services. "But regardless of the invoicing component, there is clearly a

"There is clearly a need from customers for a consolidated reporting component."



need from customers for a consolidated reporting component."

MCI's Portfolio now covers 15 of its products and services.

MCI has been refining its billing processes using a technique it calls clonable billing processes. The refinements mean that billing for a particular service is not tied to specific pieces of hardware or even a particular location. As a result, billing capacity is more flexible. If capacity is reached at one MCI processing location, the carrier can shift that month's processing to other billing locations.

Of all the carriers, MCI seems to have had the fewest problems with its billing systems, making it a leader when it comes to accuracy and overall billing capabilities.

Sprint is the only one with a truly integrated billing system. In fact, the carrier uses only one system, IPS, to bill most of its services.

Developing an integrated system is risky because it requires

top-to-bottom billing process overhauls and the carrier has to migrate customers from older billing systems to newer ones. Often, data can be lost in such a transition, impacting the financial bottom line for the carrier.

Several carriers have created ill will among users by requesting payment on call data it found months after the calls were made. Customers who receive delayed bills from new system cutovers find it difficult to plan future expenses and to track current telecommunications usage.

Sprint has a host of these problems behind it now. Sprint's IPS has enabled the carrier to launch new products more quickly in the low to mid-range of the market.

For example, Sprint's latest Business Clout offering — developed in response to AT&T's Partners in Business and MCI's Friends of the Firm programs — gives users discounts across all outbound, inbound and calling card calls as well as related services, such as SprintFAX.

Sprint has been actively looking at process improvements, particularly as more demanding services are moved onto IPS. Sprint regularly surveys its customers on billing issues and has a billing subcommittee of users reporting to the carrier.

It would be risky for AT&T to migrate customers of any service to a new integrated billing system because of the sheer number of customers the carrier must support. This is why AT&T offers integrated billing only on a customer-by-customer basis.

Overall, AT&T questions whether there is a demand beyond that of larger customers for consolidated billing and reporting. During the past 18 months, AT&T has devoted more of its vast resources to tracking and improving billing performance as opposed to simply adding more functionality to its system. The result has been a greater emphasis on changing the way call data flows through the entire pricing and billing process.

AT&T has expanded its Outbound Billing Group to include a new job category for each VTNS, SDN and Commercial Outbound service — a process manager responsible for overseeing everything from call data collection at the switch to remittance.

AT&T billing employees are encouraged to take a broader view of the process to suggest improvements. Their suggestions run the gamut from better ways of automating data entry to improving billing report formats. AT&T also devotes considerable time in its customer user groups listening to customers' opinions about its billing processes.

Some AT&T users feel this is working. "We are seeing fewer

Bill and report delivery methods

Service:	Delivery form									
	Carrier	Disk	Magnetic tape	EDI	File transfer	Microfiche	Cassette	CDROM	Real-time data transfer	E-mail
Virtual network	AT&T	Y	Y	Y	Y (2)	Y	Y	-	Y (3)	-
	MCI	-	Y	Y (2)	Y (2)	-	Y	Y	-	Y
	Sprint	-	Y	Y (4)	-	Y (2)	Y	-	-	-
Dedicated high-end outbound WATS (e.g. Megacom, Prism I, UltraWATS)	AT&T	Y	Y	Y	Y	Y	Y	-	-	-
	MCI	-	Y	Y (2)	Y (2)	-	Y	Y	-	Y
	Sprint	Y (1)	Y	Y (4)	-	Y (2)	Y	-	-	Y (1)
Dedicated mid-range outbound WATS (e.g. AT&T WATS, Prism III, Advanced WATS)	AT&T	Y	Y	-	-	Y	Y	-	-	-
	MCI	-	Y	-	-	-	-	-	-	Y
	Sprint	Y (1)	Y	Y (4)	-	Y (2)	Y	-	-	Y (1)
Switched outbound WATS (e.g. Pro WATS, Vision, Dial 1 WATS)	AT&T	Y	Y	-	-	Y	Y	-	-	-
	MCI	-	Y	-	-	-	-	-	-	Y
	Sprint	Y (1)	Y	Y (4)	-	Y (2)	Y	-	-	Y (1)
Dedicated high-end inbound WATS (e.g. Megacom 800, MCI 800-Dedicated Access, Ultra 800)	AT&T	Y	Y	-	-	-	Y	-	Y (3)	-
	MCI	-	Y	Y (2)	Y (2)	-	-	-	-	Y
	Sprint	Y (1)	Y	Y (4)	-	Y (2)	Y	-	-	Y (1)
Dedicated mid-range inbound WATS (e.g. AT&T 800, 800 Service-Dedicated Access, Direct 800)	AT&T	Y	Y	-	-	-	-	-	Y	-
	MCI	-	Y	-	-	-	-	-	-	Y
	Sprint	Y (1)	Y	Y (4)	-	Y (2)	Y	-	-	Y (1)
Switched inbound WATS (e.g. 800 Readyline, Business Line 800, FONLine 800)	AT&T	Y	Y	-	-	-	-	-	Y	-
	MCI	-	Y	-	-	-	-	-	-	Y
	Sprint	Y (1)	Y	Y (4)	-	Y (2)	Y	-	-	Y (1)
High-end calling card (e.g. virtual network, custom network)	AT&T	Y	Y	Y	Y (2)	Y	-	-	Y (3)	-
	MCI	-	Y	-	-	-	-	Y	-	Y
	Sprint	-	Y	Y (4)	-	Y (2)	Y	-	-	-
General business calling card	AT&T	Y	Y	-	-	-	-	-	-	-
	MCI	-	Y	-	-	-	-	-	-	Y
	Sprint	Y (1)	Y	Y	-	Y (2)	Y	-	-	Y (1)
Switched data (e.g. Switched 56)	AT&T	Y	Y	-	-	-	-	-	-	Y
	MCI	-	-	-	-	-	-	-	-	-
	Sprint	-	Y	Y (4)	-	Y (2)	Y	-	-	-
Private-line	AT&T	Y	Y	Y	-	Y	-	-	-	-
	MCI	-	-	-	-	-	-	-	-	Y
	Sprint	-	Y (2)	Y (4)	-	Y (2)	Y (2)	-	-	-
Facsimile network	AT&T	Y	Y	-	-	-	-	-	-	-
	MCI	-	Y	-	-	-	-	-	-	Y
	Sprint	-	-	-	-	-	-	-	-	-

- (1) For Sprint Corp., E-mail delivery is a function of FONView; FONView is not available for National Accounts Division (NAD)-billed accounts.
(2) Available as a custom offering only. For Sprint, microfiche is a standard offering for all Invoice Processing System (IPS) accounts and is a custom offering for NAD-billed accounts.
(3) Available in the second quarter.
(4) Sprint EDI delivery is available to NAD-billed accounts, not IPS at this time.

Sprint-specific notes: For most accounts, customers of services for which the combination of magnetic tape, EDI, microfiche and cassette is available can define their own invoice structure. This media combination may offer consolidated billing based on the way the customer is set up in the Sprint billing system.

SOURCE: TELECHOICE, INC., MONTCLAIR, N.J.

billing issues, and the ones we are seeing are being resolved more quickly," says Jeff Price, telecommunications manager at Hewlett-Packard Co. and a member of the Technical Committee of the SDN Users Association. "AT&T is communicating better with us and within its own structure."

Price adds that he would have rated AT&T's billing a 4 on a scale of 1 to 10 just 18 months ago but would now rate it a solid 7.

Different strokes

Each carrier has taken a different route to get to the same neighborhood. Customers of AT&T and Sprint note marked improvements in the two carriers' billing, while MCI's customers feel that there was never anything wrong.

If the billing improvements continue, users can ask carriers for more advanced options in reporting.

Billing, as an ingredient of the overall carrier product mix, has reached a new plateau. Much of the user energy that had been channeled toward replicating

carrier billing systems to verify bills is being redirected toward more strategic efforts. This is not to say that users are giving up their close oversight of their bills. It simply means that the errors are becoming fewer over time.

"When you get what you need,

power of their billing systems to specific customer applications.

Users should continue to pressure the carriers to take more responsibility for meeting their needs. As communications staffs get smaller and demand for resources increases, the last thing

Each carrier has taken a different route to get to the same neighborhood.



you think about what you want," says L. Thomas Walton, president of Walton and Walton Associates, Inc., an industry consulting firm in Richmond, Va. "Users should start asking their carriers to fit the billing of interexchange services into the way they do business."

With greater reliability and confidence in their systems, the carriers are working to tailor the

end users should have to do is rework carrier bills to fit specific corporate requirements. ■

Briere is president and Finn is an associate of TeleChoice, Inc., a Montclair, N.J., consultancy specializing in strategic planning and analysis of intelligent networks, services and applications. They can be reached at (201) 746-0200.



Routers may test frame relay users' patience

Tests show not all LAN routers are created equal when it comes to supporting frame relay standards.

Of all the emerging high-speed data communications technologies, frame relay looks the least like rocket science. Frame relay is a fast and efficient protocol for sending data over packet nets because it carries little overhead compared to complex Integrated Services Digital Network protocols.

But the findings from a test of routers conducted for *Network World* by AT&T Bell Laboratories and two leading test equipment vendors indicate users are likely to encounter interoperability snags when connecting their routers to frame relay services and linking various brands of routers that have different frame relay interfaces.

For technical, economic and management reasons, carriers are likely to implement variations of the loosely defined frame relay specification on their switches. As a result, users may be forced to fine-tune their customer premises equipment, such as routers, to operate with different carrier services.

In the first round of *Network World's* Frame Relay Test Series, ex-

perts from AT&T Bell Labs, Telenex Corp. and Wandel & Goltermann Technologies, Inc. tested frame relay interfaces on four Ethernet routers: Advanced Computer Communications' (ACC) ACS 4200 Bridge/Router, Cisco Systems, Inc.'s CGS Router, Wellfleet Communications, Inc.'s Link Node/Model 2000 Router and 3Com Corp.'s NetBuilder Bridge/Router.

Too much latitude

Of the models tested, all four frame relay routers could delimit frames, assess a 10-bit address and communicate with a similar brand frame relay device. However, the frame relay standard is so broad that it allows vendors great latitude in how they implement frame relay in their products.

As a result, the test found that although all the routers transmitted frames successfully across a simulated frame relay network, there is no standard implementation of frame relay by equipment manufacturers.

This has two consequences for users. Equipment from different vendors may not be able to communicate with one another directly due to the different implementations of the standard. And a frame relay device may not be able to attach to a particular frame relay service if the service provider has implemented options within the frame relay standard that are different than those options selected by the equipment manufacturer.

To investigate how the various implementations of the standard would impact a network manager, the test team developed a battery of tests that

would give users an indication of how the available products work in a frame relay setting.

The test suite, which was based on a frame relay certification test under development by AR Test Systems, a unit of Telenex, consisted of 26 tests.

Of those, 24 tested a frame relay device's behavior under normal and abnormal conditions.

The other two tested the router's ability to receive and process a heavy traffic load delivered in rapid succession as a stream of small but legal frames.

The team assembled a test bed network (see "Test bed uses analyzers to simulate net conditions," page 36) in order to support connection of the routers for the tests being conducted.

The tests fell into five categories: Data Link Connection Identifier (DLCI) management, local management interface (LMI) format errors, LMI procedures, format errors on subscriber Data Link Control (DLC) and data transfer.

DLCI management

The seven DLCI management tests examine each routers' behavior under six normal conditions and one abnormal condition when the network assigns, activates, deactivates and deletes DLCIs through the LMI protocol on a

frame relay link.

The DLCI is a 10-bit identifier, which contains the frame's destination, and is used by a switch to set up a permanent virtual circuit between devices.

LMI's DLCI management procedures, especially the ability to declare a DLCI active or inactive, are the network's only ways to manage activity on the link, short of deactivating the link or discarding frames.

Current frame relay recommendations only describe the protocol procedures for DLCI management. Implementors must still decide how — or even whether — to follow those procedures.

The routers from ACC and 3Com followed the letter and spirit of DLCI management, transmitting only on DLCIs that the network had declared present and active; when a DLCI was deactivated, the routers did not transmit frames.

The Wellfleet router followed the procedures in all cases except one. It accepted the assignment of a DLCI number (DLCI 0) that is reserved by the standard for use by the ANSI link management procedure and used the DLCI 0 link to transmit data.

Such an action could block the path of management information to flow across the router.

(continued on page 36)



Test team members (l. to r.): Raul Sitavi, Wayne Driver, Robert Moul, Nam Nguyen and Mike Winslow.

Routers tested

- Advanced Computer Communications' ACS 4200 Bridge/Router
- Cisco Systems, Inc.'s CGS Router
- Wellfleet Communications, Inc.'s Link Node/Model 2000 Router
- 3Com Corp.'s NetBuilder Bridge/Router



By NICHOLAS LOMBARDO

Intangible factors key in frame relay

Based on the frame relay test findings, the evaluation team concluded that router behavior for a specific frame relay certification test should be a small consideration when choosing a device — at least until the carriers begin enforcing standards on their frame relay networks.

Given the state of the technology, users would fare well by weighing other factors when selecting a router with frame relay capabilities.

User interface

Based on the frame relay testing, we concluded that router vendors in general could do a better job on user interfaces.

Four companies' — Advanced Computer Communications (ACC), Cisco Systems, Inc., 3Com Corp. and Wellfleet Communications, Inc. — routers were tested, and all four user interfaces were difficult and confusing to use. Wellfleet's Link Node/Model 2000 Router's menu system was the best of a bad lot, but the Wellfleet unit required a complete reboot for any changes to its configuration.

ACC's ACS 4200 Bridge/Router's naked Unix command line interface was the worst. Both the 3Com NetBuilder Bridge/Router and ACC user interfaces employed similar awkward command structures consisting of long, unpunctuated strings of abbreviations with little mnemonic value.

3Com's menu interface helped solve some high-level

configuration problems, but the test team had to use detailed commands in order to get the 3Com routers working on the network.

Statistics

All four routers provided numerous tables of error and performance statistics. All the routers grouped their statistics differently and used various names for common features. In general, statistics were more complete for the local-area network interface than for the frame relay port. On the frame relay side, the four routers recognized and counted the most common protocol error: bad frame checks.

Only the Wellfleet router identified long frames on the wide-area side.

Frame relay support is a relatively new and fast-developing feature. In time, the frame relay displays should catch up with their LAN counterparts.

Pinging

The Internet Control Message Protocol echo test, commonly known as the ping test, is a standard feature of the Internet Protocol and is indispensable when setting up a router. The test allows one device to send a message to a specific IP address anywhere on an internetwork and have that device return a message in a similar way — comparable to how an underwater object returns a sonar ping.

Pinging is the fastest and eas-

iest way to verify a working path through a network.

The ACC, Cisco and Wellfleet routers can transmit their own ping messages when commanded by their management consoles. This is a handy feature that could be used to augment external test equipment when troubleshooting problems on a working net.

User documentation

All four routers came with two to four thick user manuals, and unlike the routers' user interfaces, every vendor's documentation was helpful. ACC's user manual stands out the most because of the number and quality of its illustrated examples. The Cisco manuals, which also liberally use examples, was second-best.

The Wellfleet and ACC manuals provide excellent tutorials on routing.

Service hot lines

While configuring the routers, the test team had occasion to use all four vendors' telephone technical support services. Representatives from all four vendors were knowledgeable, helpful and courteous, and the test team could not have completed the tests without their help.

The phone representatives from ACC and 3Com deserve special credit for staying with the team through some interesting user interface problems.

— Nicholas Lombardo

the LMI header. LMI messages are framed according to the Link Access Procedure (LAP) D specification for ISDN Layer 2 and contain header information formatted according to ISDN Layer 3 recommendations.

The fields in which these tests introduced errors — Layer 2 Message Code, Layer 3 Message Code, Layer 3 Protocol ID and Layer 3 Dummy Call Reference — all have fixed values according to the frame relay specifications. The information in these parts of the LMI header is useful when frame relay is running as one of several data streams on an ISDN B channel, where the fields discriminate LMI messages from those on the same channel using other protocols.

In the first test of the LMI header format, all but the Cisco router rejected STATUS messages in which the Layer 2 Message Code contained a value other than that for a LAP D Unnumbered Information frame. In the second test, all four routers rejected STATUS messages in which the Layer 3 Message Code contained a value other than that for a STATUS message.

In the third test, all but the Cisco router rejected STATUS messages in which the Layer 3 Protocol ID contained a value other than that for an LMI message.

LMI procedures test

The test team then moved away from examining LMI format errors to investigate the routers' behavior under different LMI procedure conditions. In a normal frame relay link, an LMI ex-

change lets the frame relay device know the link is active.

The first test in this series simulated a subscriber device failure by having a Telenex Interview 8800 Turbo analyzer on the test net "turn off" the wide-area side of the LMI exchange. The Interview 8800 stopped sending STATUS messages in response to STATUS ENQUIRY messages from the routers. In a working network, this would indicate a serious failure to the subscriber devices.

All four routers stopped data transmissions and continued to poll the network for LMI traffic by sending STATUS ENQUIRY mes-

All four routers recognized the low-level errors.

▲▲▲

sages at regular intervals.

During the next test, the INTERVIEW 8800 introduced errors into the LMI "heartbeat" procedure. The heartbeat procedure involves a simple exchange of sequence numbers between the network and router to ensure that each LMI message has been handled properly. A simple receipt of a STATUS message tells the router the network is functioning normally.

(continued on page 38)

(continued from page 35)

Surprisingly, the router from Cisco, an original author of the LMI specification, ignored the DLCI management procedures in all cases except the illegal DLCI.

LMI format errors

The next set of seven tests examined what would happen in the event of LMI format errors. A router's inability to recognize an LMI format error could lead to several problems, including confusing a portion of the frame header for data. "In a worst case scenario, a router's inability to identify errors in the LMI header could lead to the loss of the link," says Robert Moul, supervisor of AT&T Bell Labs' applications engineering group.

All of the LMI format error tests presented the routers with a single format error, and each successive test pushed the error further into the LMI header field.

The first test introduced simple frame check sequence errors in the network's STATUS mes-

sages. All four routers recognized the low-level errors and ignored the messages.



Bell Labs' Nguyen (seated) and Moul examine test results.

The next two tests inverted the Extended Address (EA) indicators in the frame relay protocol headers of the STATUS messages. An inverted EA error might cause a router to miss the true destina-

tion address of a frame and look into the data portion of the frame for the address. Failing to find a valid address, it would discard the frame, which would defeat one of the benefits of frame relay — namely that, unlike older protocols such as X.25, frame relay requires less packet processing.

A value of 1 in any EA bit indicates the end of address information. This value should never appear in Octet 0, because portions of the DLCI must appear in each of the first two octets. The EA function is optional and irrelevant in the LMI protocol. Therefore, devices are free to ignore it.

Both the Cisco and Wellfleet routers accepted STATUS messages, despite the inverted EA bits. When EA bits were inverted in data frames on a subscriber DLCI, the Wellfleet router recognized the error and ignored the frames. Both the ACC and 3Com routers rejected STATUS messages with inverted EA bits.

Other LMI error tests presented errors in different portions of

Test bed uses analyzers to simulate net conditions

The frame relay evaluation team conducted a battery of tests on a net comprising a router pair tested at any given time, a thin-wire Ethernet segment on the LAN side of each router and a V.35 connection on the wide-area side of each router.

The network test bed, located at AT&T Bell Laboratories facilities in Middletown, N.J., was set up so each Ethernet segment terminated in a separate analyzer card on a Wandel & Goltermann Technologies, Inc. DA-30 dual-protocol analyzer.

The DA-30 generated Ethernet traffic, simulated local-area network nodes and collected LAN statistics at various times during the tests.

Each frame relay link terminated at a V.35 port on a Telenex Corp. Telenex/AR Test Systems Interview 8800 Turbo

protocol analyzer. The Interview 8800 acted as a frame relay switch in a public network, switching traffic between links, generating data and monitoring performance.

For the two tests of the routers' data transfer capabilities, the Interview 8800 and the DA-30 acted as pitcher and catcher, respectively, across a single router on one frame relay link in addition to one Ethernet segment.

During setup and testing, information on the routers' behavior was culled from the Interview 8800, the DA-30 and statistical displays on each router's management console. Also, the Interview 8800 and the DA-30 ran applications designed by their manufacturers to create test scenarios.

— Nicholas Lombardo



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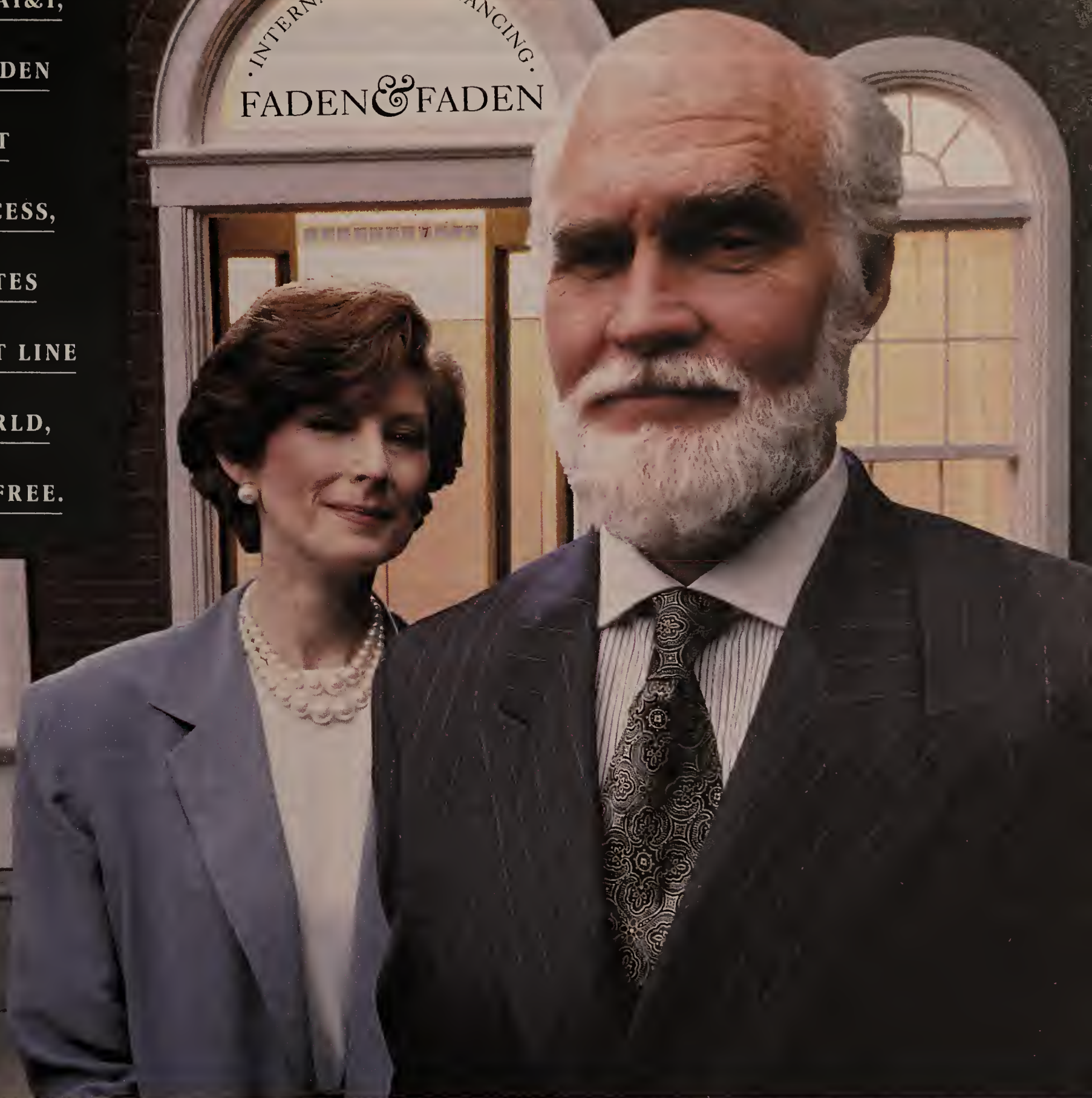
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Frame relay test results (Configuration A)

Test type (1)	Action	Result
DLCI assignment	Interview transmits full STATUS message containing one PVC STATUS information element with active bit set to "off," waits for acknowledgement in router's next STATUS ENQUIRY, then monitors deactivated DLCI for frames.	3Com Corp.'s NetBuilder Bridge/Router (2), Advanced Computer Communications's ACS 4200 Bridge/Router (3) and Wellfleet Communications, Inc.'s Link/Node Model 2000 Router (4) acknowledge STATUS message by incrementing LRSN but do not transmit frames over deactivated DLCI. Cisco Systems, Inc.'s CGS Router (5) acknowledges STATUS message by incrementing LRSN but continues to transmit messages over deactivated DLCI.
	Interview transmits full STATUS message containing one PVC STATUS information element with active bit set to "on," waits for acknowledgement in router's next STATUS ENQUIRY, then monitors reactivated DLCI for frames.	All routers acknowledge STATUS message by incrementing LRSN in next STATUS ENQUIRY and resume transmission of frames over reactivated DLCI.
	Interview deactivates previously activated DLCI by transmitting full STATUS message with active bit set to "off" in PVC STATUS information element for that DLCI, then monitors deactivated DLCI for frames.	NetBuilder, ACS 4200 and 2000 Router acknowledge STATUS message by incrementing LRSN in next STATUS ENQUIRY and stop transmitting frames over deactivated DLCI. CGS Router acknowledges STATUS message by incrementing LRSN in next STATUS ENQUIRY but continues to transmit frames over deactivated DLCI.
	Interview transmits full STATUS message with PVC STATUS information element for DLCI under test; at next full STATUS interval, transmits full STATUS message without PVC STATUS information element for that DLCI, then waits for acknowledgement and monitors deleted DLCI for frames.	NetBuilder, ACS 4200 and 2000 Router acknowledge full STATUS message by incrementing LRSN in next STATUS ENQUIRY and stop transmitting over deleted DLCI. CGS Router acknowledges full STATUS message by incrementing LRSN in next STATUS ENQUIRY but continues to transmit frames over deleted DLCI.
	Interview transmits full STATUS message with 3 PVC STATUS information elements to each of 2 routers, assigning 3 paths through the network, waits for acknowledgement, then monitors 3 newly defined DLCIs for frames.	All routers acknowledge full STATUS message by incrementing LRSN in next STATUS ENQUIRY.
	Interview transmits full STATUS message to both routers, deleting 2 of the 3 DLCIs previously defined, waits for acknowledgement, then monitors all 3 DLCIs for frames.	NetBuilder, ACS 4200 and 2000 Router acknowledge full STATUS message by incrementing LRSN in next STATUS ENQUIRY and stop transmitting on deleted DLCIs. CGS Router acknowledges full STATUS message by incrementing LRSN but continues to transmit on 1 or more of the deleted DLCIs.
	Interview transmits full STATUS message with PVC STATUS information element defining DLCI, waits for acknowledgement, then monitors illegal DLCI for frames.	NetBuilder, ACS 4200 and CGS Router acknowledge full STATUS message by incrementing LRSN in next STATUS ENQUIRY and transmit no frames on illegal DLCI. 2000 Router acknowledges full STATUS message by incrementing LRSN in next STATUS ENQUIRY but transmits frames over illegal DLCI.
LMI format errors	Interview corrupts frame check sequence on all STATUS messages, then monitors LMI DLCI for acknowledgements.	All routers ignore errored STATUS message and do not increment LRSN LMI format errors.
	Interview sets extended address bit in Octet 0 of all STATUS messages to 1, indicating premature end of DLCI, then monitors LMI DLCI for acknowledgement of illegal STATUS messages.	CGS Router and 2000 Router acknowledge illegal STATUS messages by incrementing LRSN in STATUS ENQUIRY messages. NetBuilder and ACS 4200 do not acknowledge illegal STATUS message and do not increment LRSN.
	Interview sets extended address bit in Octet 1 of all STATUS messages to 0, illegally indicating continuation of address in next octet, then monitors LMI DLCI for acknowledgement of illegal STATUS messages.	CGS Router and 2000 Router acknowledge illegal STATUS messages by incrementing LRSN in STATUS ENQUIRY messages. NetBuilder and ACS 4200 do not acknowledge illegal STATUS message and do not increment LRSN.
	Interview sets Layer 2 message code in LMI header of STATUS messages to illegal value, then monitors LMI DLCI for acknowledgement.	NetBuilder and CGS Router acknowledge illegal STATUS messages by incrementing LRSN. ACS 4200 and 2000 Router do not acknowledge illegal STATUS message and do not increment LRSN.
	Interview sets Layer 3 message code in LMI header of STATUS messages to illegal value, then monitors LMI DLCI for acknowledgement.	None of the routers acknowledge illegal STATUS messages or increment LRSN.
	Interview sets Layer 3 Protocol ID in LMI header of STATUS messages to illegal value, then monitors LMI DLCI for acknowledgement.	CGS Router acknowledges illegal STATUS messages by incrementing LRSN. NetBuilder, ACS 4200 and 2000 Router do not acknowledge illegal STATUS messages and do not increment LRSN.
	Interview sets Layer 3 dummy call reference field in LMI header of STATUS messages to illegal value, then monitors LMI DLCI for acknowledgement.	NetBuilder and CGS Router acknowledge illegal STATUS message by incrementing LRSN. ACS 4200 and 2000 Router do not acknowledge illegal STATUS message and do not increment LRSN.
LMI procedures	Interview stops sending STATUS messages in response to STATUS ENQUIRY messages from router, then monitors all defined DLCIs for frames, causing LMI procedures to time out.	All routers continue to send STATUS ENQUIRY messages without incrementing LRSN but stop transmitting frames.
	Interview sends STATUS messages without incrementing LRSN in keep-alive information element, thus failing to acknowledge router's STATUS ENQUIRY messages properly.	All routers maintain normal heartbeat sequence, incrementing own LRSN and effectively ignoring error in STATUS message.
	Interview maintains normal "heartbeat" sequence in LMI protocol; operator observes router's behavior as current sequence number reaches maximum value.	NetBuilder and ACS 4200 reset current sequence number to 1 in first STATUS ENQUIRY message after Current Sequence Number reaches 255. CGS Router and 2000 Router reset Current Sequence Number to 0 in first STATUS ENQUIRY after it reaches 255.

DLCI = Data Link Connection Identifier
LMI = Local management interface
LRSN = Last received sequence number
PVC = Permanent virtual circuit

- (1) Telenex's Interview 8800 Turbo protocol analyzer emulates frame relay network between two routers under test while Wandel & Golterman Technologies, Inc.'s DA-30 protocol analyzer provides data from each Ethernet segment to address on the other. Interview monitors both frame relay links.
(2) NetBuilder is running NetBuilder FRX25-1.1.0.21.
(3) ACS 4200 is running ACS Series 4000 Version 5.0.
(4) CGS Router is running Version 8.3(2) software.
(5) 2000 Router is running Version 5.71 software.

SOURCE: TELENEX CORP., SPRINGFIELD, VA.

(continued from page 36)

All four routers handled this irregular heartbeat test without any problems. They all continued to transmit STATUS ENQUIRY messages in normal sequence.

The third test deliberately failed to increment the last received sequence number in the keep-alive information elements of the STATUS ENQUIRY messages to see how each router behaved.

By a strict reading of the frame relay recommendation, the Current Sequence Number should never be set to 0 in normal operations. It should wrap from a value of 255 to 1.

Some implementations reserve the 0 digit to signal that the network or the subscriber has reset the LMI process in response to an error.

The Cisco and Wellfleet routers wrapped the Current Sequence Number to a value of 0;

the ACC and 3Com routers wrapped to a value of 1.

Errors on subscriber DLC

This series of tests investigated how the routers could handle DLC errors. Frames with common low-level errors, such as corrupted frame check sequences and aborted frames, were sent to the routers.

All four routers recognized corrupt frame check sequences and indicated the errors on the statistical displays of their management consoles.

In addition, all four routers recognized aborted frames. However, the Cisco router did not indicate this error on its console.

"The occurrence of aborted frames could be due to a line problem," says Raul Sitavi, applications and technical support engineer at Wandel & Goltermann. "Knowing that aborted frames are arriving at the router could be

helpful to a network manager when diagnosing a problem."

For instance, if response time on a network drops and a router can detect aborted frames, the network manager could begin

the frame relay header as the earlier LMI format tests.

The ACC and Wellfleet routers discarded the frames with errors, while the Cisco and 3Com routers ignored the errors and passed the

“The occurrence of aborted frames could be due to a line problem,” Sitavi says.

▲▲▲

looking at line problems as a source of the performance decline.

If the aborted frames are not reported, it just makes the job of troubleshooting a little more difficult.

The next two tests presented the same errors in the EA bits of

frames onto the Ethernet segment.

Rerouting frames back onto the Ethernet could cause a dip in performance because the router would dump invalid data onto the local-area network.

To see how the routers handled short frames, the Interview

8800 inserted one three-octet frame per second into an otherwise normal data stream for one minute. The frame relay recommendations require a minimum length of five octets per frame: two octets of frame relay header and three of data.

All the routers discarded the short frames at their frame relay ports, but none counted the short frames as errors on their statistical displays.

In the final test of this series, the Interview 8800 inserted one illegally long frame (8,000 octets per second) into a normal data stream for one minute. All of the routers discarded the illegal frames, but only the Wellfleet router indicated errors on its statistical display.

The lack of reporting of these errors will not bring down a frame relay network. "Knowing these errors are occurring can help the [net manager] see prob-

Frame relay test results (Configuration B)

Test type (1)	Action	Result
Error handling on subscriber data link control	Telenex Corp.'s Interview 8800 Turbo transmits test data, with frame check sequence corrupted in all frames; Wandel & Goltermann Technologies, Inc.'s DA-30 monitors for presence of data on Ethernet segment.	None of the routers pass errored frames from frame relay port onto Ethernet. Router statistics indicate errors on frame relay port.
	Interview 8800 transmits data pattern of aborted frames; DA-30 monitors for presence of data on Ethernet segment.	3Com Corp.'s NetBuilder Bridge/Router (2), Advanced Computer Communications, Inc.'s ACS 4200 Bridge/Router (3) and Wellfleet Communications, Inc.'s Link Node/Model 2000 Router (4) do not pass aborted frames from frame relay port onto Ethernet; router statistics indicate errors on frame relay port. Cisco Systems, Inc.'s CGS Router (5) does not pass errored frames from frame relay port onto Ethernet; router statistics do not indicate errors.
	Interview 8800 emulating frame relay network intercepts frames on 1 link, sets extended address bit in Octet 0 to 1, incorrectly indicating end of address, and routes errored frames onto second frame relay link. DA-30 monitors for presence of data on Ethernet segment.	ACS 4200 and 2000 Router do not pass errored frames from frame relay port onto Ethernet. NetBuilder and CGS Router ignore corrupted address and pass packets from errored frames onto Ethernet.
	Interview 8800 emulating frame relay network intercepts frames on 1 link, sets extended address bit in Octet 1 to 0, incorrectly indicating extended address, and routes errored frames onto second frame relay link. DA-30 monitors for presence of data on Ethernet segment.	ACS 4200 and 2000 Router do not pass errored frames from frame relay port onto Ethernet. NetBuilder and CGS Router ignore corrupted address and pass packets from errored frames onto Ethernet.
	Interview 8800 emulating frame relay network inserts 1 short (3-octet) frame/sec into data stream between routers for 1 minute; DA-30 monitors Ethernet segment for frames.	None of the routers pass short frames from frame relay port onto Ethernet. Router statistics do not indicate presence of short frames on frame relay link.
	Interview 8800 emulating frame relay network inserts 1 long (8,000-octet) frame/sec into data stream between routers for 1 minute; DA-30 monitors Ethernet segment for long frames.	None of the routers pass long frames from frame relay port onto Ethernet. Router statistics from NetBuilder indicate presence of errors on frame relay link. Router statistics from ACS 4200, CGS Router and 2000 Router do not indicate presence of long frames on frame relay link.
Data transfer	DA-30 transmits continuous stream of valid packets onto 1 Ethernet segment addressed for other Ethernet segment for 5 minutes. Interview 8800 monitors frame relay links for presence of data and errors.	All routers route data correctly.
	With Local Management Interface disabled on the frame relay link, Interview 8800 transmits stream of contiguous (only shared flag between frames) frame of 50-octet payload, plus frame relay header and frame check sequence at 1.536M bit/sec. DA-30 detects maximum packet rate on Ethernet segment.	NetBuilder: 1,237 packet/sec; ACS 4200: 3,617 packet/sec; CGS Router: 3,622 packet/sec; 2000 Router: 3,615 packet/sec
	DA-30 transmits stream of packets of 50-octet payload, plus Ethernet media access control framing. Interview 8800 detects maximum frame/sec on frame relay link.	NetBuilder: 1,584 frame/sec; ACS 4200: 3,547 frame/sec; CGS Router: 3,365 frame/sec; 2000 Router: 3,548 frame/sec

- (1) Interview 8800 protocol analyzer emulates a frame relay network between 2 routers, transmitting test data on frame relay links; DA-30 protocol analyzer monitors test data on Ethernet segments behind routers. Operators monitor DA-30 and routers' statistical displays for results.
(2) NetBuilder is running NetBuilder FRX25-1.1.0.21.
(3) ACS 4200 is running ACS Series 4000 Version 5.0.
(4) 2000 Router is running Version 5.71.
(5) CGS Router is running Version 8.3[2].

SOURCE: TELENEX CORP., SPRINGFIELD, VA.

lems [such as line disturbances] developing," AT&T's Moul says.

Data transfer test

The last series of tests includes a simple data transfer test and two stress tests of the routers' absolute data transfer rate under a simulated load of abnormally heavy traffic.

In the first test, which evaluated the receiving ability of the four routers, the Wandel & Goltermann DA-30 dual protocol analyzer transmitted a continuous

stream of valid packets for five minutes from one of its Ethernet ports, through the test network, to its other Ethernet port.

The Interview 8800 simulated the frame relay network and monitored the routers' traffic for data and errors. None of the routers had any problems with this normal data transfer test.

The first stress exercise evaluated the receiving capacity of the routers' frame relay interfaces. A stream of short but legal frames was transmitted at the T-1 rate of

1.536M bit/sec. The idle time between frames was progressively reduced, which increased the frame rate.

The test frames contained 50 octets of data plus frame relay headers and frame check sequences. The ACC, Cisco and Wellfleet routers placed more than 3,600 frames per second onto the Ethernet before discarding frames. The 3Com router passed about 1,200 frames per second.

It should be noted that the 3Com router is positioned as a low-cost router compared to the other three. This raw performance difference is a price/performance trade-off.

The unit is designed to perform tasks that don't require fast throughput. For instance, it wouldn't need high throughput speeds to handle Novell, Inc. Internetwork Packet Exchange (IPX) traffic, which is bursty in nature.

One other caveat is that the test team conducted static routing in the data transfer stress tests, choosing not to use the Routing Information Protocol (RIP). In instances where the test team did employ the RIP protocol, the performance was as much as 50% slower, Moul said.

The second stress test evaluated the transmitting capacity of the routers' frame relay interfaces. The DA-30 generated a stream of 64-octet packets on the Ethernet. The ACC, Cisco and Wellfleet routers all transmitted

more than 3,000 frames per second before discarding frames. The 3Com router transmitted just under 1,600 frames per second before discarding frames.

The main point to draw from the testing is that frame relay routers are in their early stages of development. All four routers tested can perform the basic tasks of handling frames in a frame relay network.

However, the tests found that the routers implement frame relay in different ways, which may

place the burden of fine-tuning equipment on users.

But it is hoped that this type of action will be short-lived.

Groups such as the Frame Relay Forum continue to encourage vendors and service providers to adopt common implementations of the frame relay specification. □

Lombardo is senior product specialist of diagnostic products at Telenex Corp.'s AR Test Systems in Springfield, Va.

Introducing the experts from the test team

Putting aside competitive differences, experts from AT&T Bell Laboratories and test equipment makers Telenex Corp. and Wandel & Goltermann Technologies, Inc. joined forces for the frame relay tests.

The team consisted of Robert Moul, supervisor of AT&T Bell Labs' applications engineering group in Warren, N.J.; Nam Nguyen, member of the technical staff at AT&T Bell Labs in Middleton, N.J.; Raul Sitavi, applications and technical support engineer at Wandel & Goltermann in Research Triangle Park, N.C.; Wayne Driver, product manager for internetwork field instruments at Wan-

del & Goltermann; Mike Winslow, manager of technical support at Telenex Corp.'s AR Test Systems in Springfield, Va.; and Nick Lombardo, senior product specialist at Telenex's AR Test Systems.

All test team members helped configure the routers. In addition, Moul acted as the on-site manager for the tests; Nguyen handled much of the preliminary work with the router vendors; Sitavi operated and programmed the DA-30; Driver operated the test equipment; Winslow operated and programmed the Interview 8800; and Lombardo kept score of and prepared the test results.

Letters

continued from page 31

network elements can send their TL/1 messages via Ethernet and, from there, into a router through the X.25 network.

TL/1 is very inefficient from a data-transfer perspective. Instead of a single bit indicating the presence of an alarm, a typical TL/1 message, also indicating the presence of an alarm, contains 128 characters.

Delays in generating the message from the network element and transferring it to the host can exceed eight seconds under typical conditions, and the wait can be much longer when the network is congested.

Worse, messages can be lost or discarded during net overload or failure conditions. TL/1 does not have an application-level acknowledgment, so the network element cannot be certain that

the message was received. The network management host is then out of synchronization with the network elements, which is a dangerous situation.

The host can then detect a lost message by the missing Sequence indicator but must request a complete update from the network element in order to regain synchronization.

Polling in a TL/1 network can exacerbate the loading problem because of the large number of characters that must be transferred.

Although the focus of your article was Simple Network Management Protocol and LAN structures, we find the same issues affecting wide-area public telecommunications network telemetry.

Kevin Grantham
Director of marketing
Westronic Systems Corp.
Richardson, Texas

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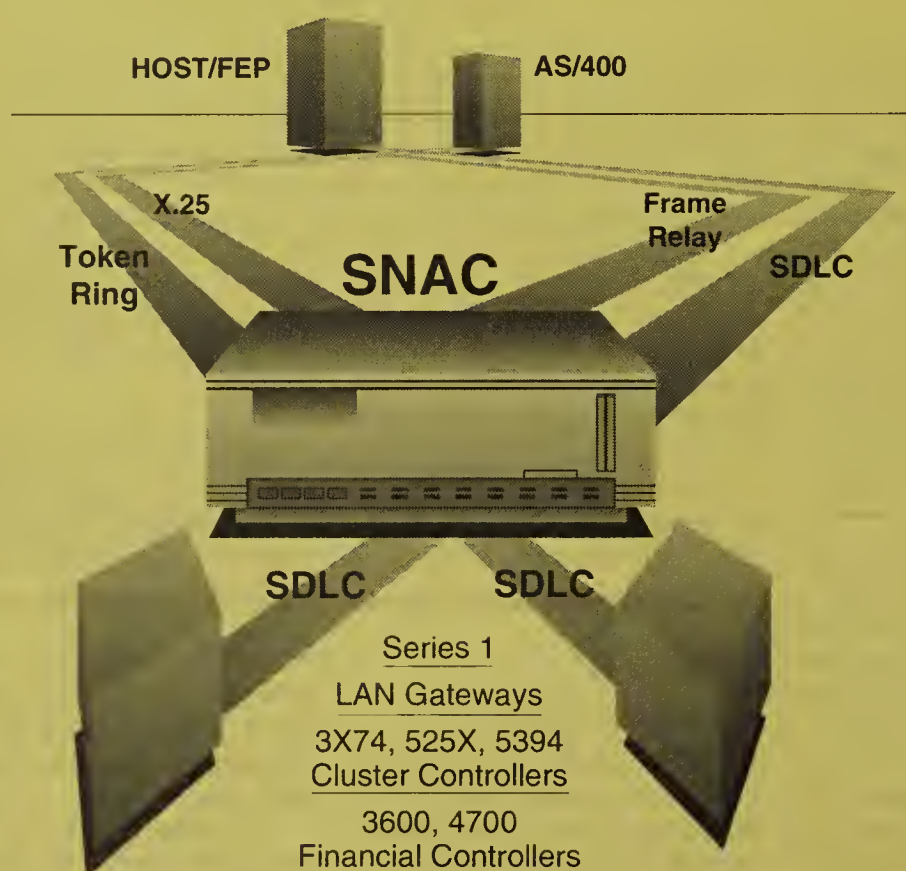
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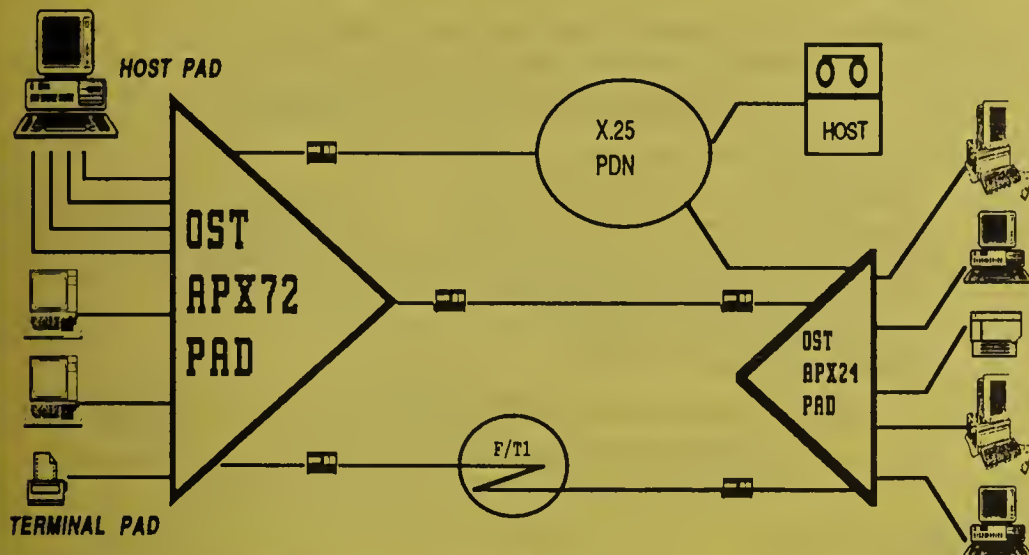
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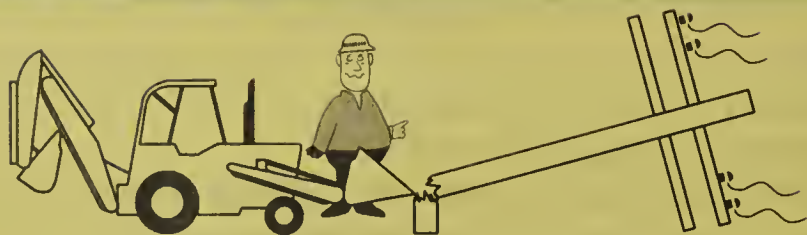
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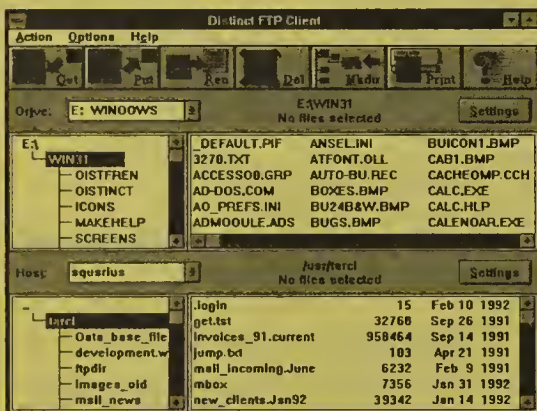
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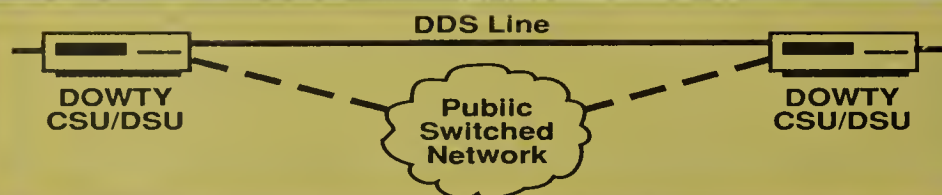
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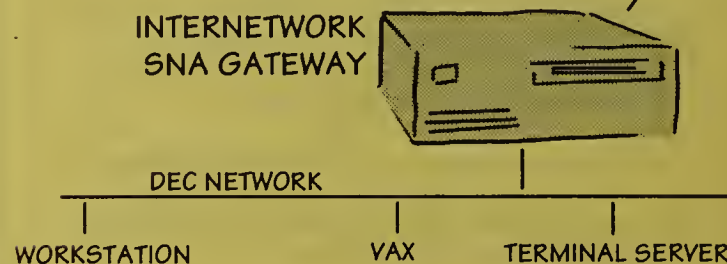
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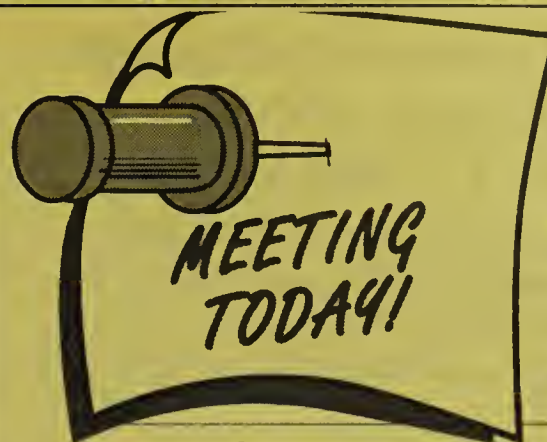
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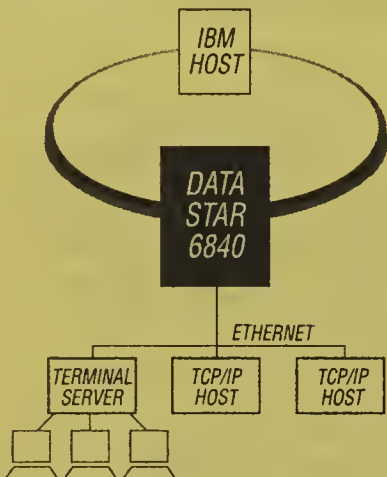


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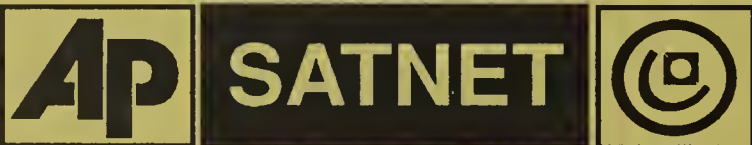
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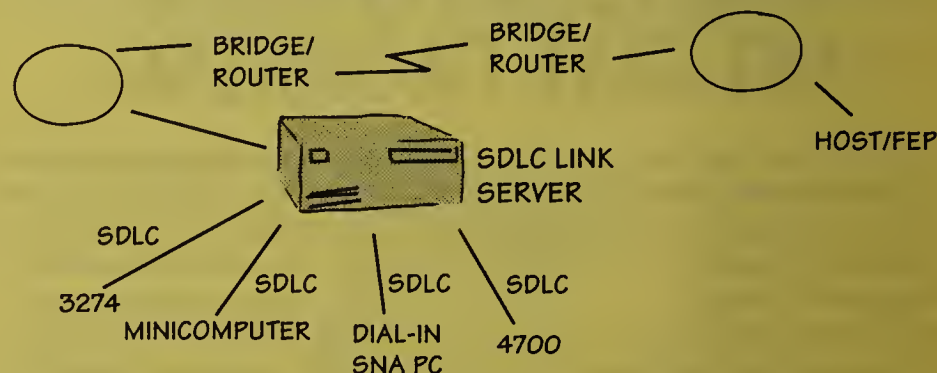
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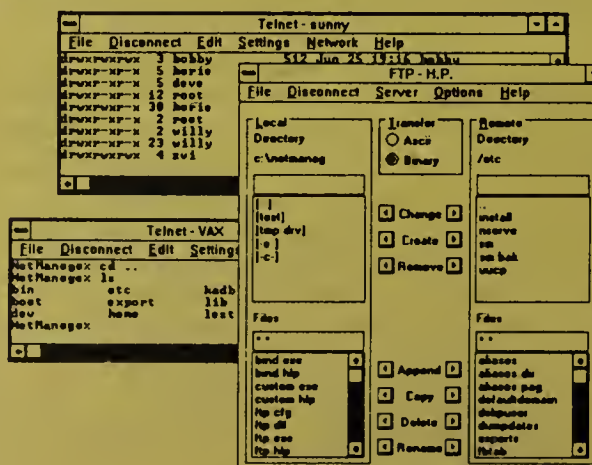
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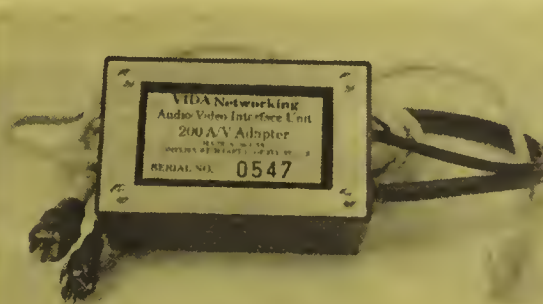
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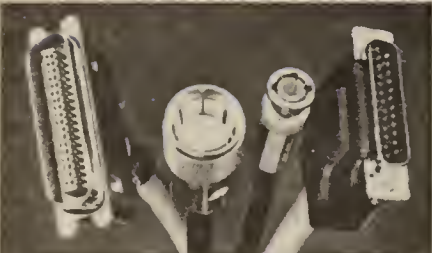
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Link Notes

continued from page 15

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announced a program that trade in any vendor's net in order to buy Ungermann-Bass net management system.

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Forum charts frame relay course

continued from page 6

AppleTalk," Jones said. "Routers and bridges will only need a software upgrade to support it."

With the proposed encapsulation process, data would be encapsulated into frames that carry a network-layer protocol identification, which tells the receiving device which protocol is contained.

The Frame Relay Forum is also working on a common specification that vendors

could use to offer 45M bit/sec T-3 access port and trunking speeds.

Although existing frame relay services support T-1 and sometimes 2.048M bit/sec E-1 port speeds, carriers are beginning to see demand for T-3 access port speeds for higher bandwidth applications. "It's not a real big customer issue right now, but it will be in the future," Jones said.

Higher speed public frame relay service could emerge as a viable alternative to Switched Multimegabit Data Service, which is perceived by the industry as the top high-end switched data service. "High-speed

frame relay would give users a choice they really don't have today," Jones said.

The forum is also working with the National Institute of Standards and Technology (NIST) in an effort to get frame relay specified as a transport option in GOSIP.

AT&T's Kapoor said the forum needs to conduct a GOSIP trial using frame relay before NIST can add it as an option.

Sprint Corp., a forum member and one of the two carriers providing the General Services Administration with services under Federal Telecommunications System 2000, is considering such a trial for later

this year or in early 1993, Kapoor said. Sprint declined comment.

Interoperability testing

The Frame Relay Forum's testing and interoperability committee used the meeting to update members on its progress.

Ross Kocen, chairman of the committee and a product marketing manager with Telelec, Inc., a Calabasas, Calif., test equipment vendor, said Bell Communications Research submitted a list of more than 100 types of tests that users and vendors can perform to determine whether products are frame relay-compliant.

"This is a major milestone," Kocen said. "Bellcore has invested a great deal of time putting together these tests. And it's excellent news that they plan to put these in the public domain."

The committee also received a joint submission from AT&T Bell Labs and Bell Northern Research — Northern Telecom, Inc.'s research arm — that explains how their frame relay customer premises equipment and network switches can interoperate.

The committee is working with OSINET Corp., which runs the X.25 OSI test network, to develop frame relay interoperability tests this summer. The tests would be administered in test labs certified by NIST. Kocen said 16 labs have expressed an interest in conducting the trials.

The forum said it will team with OSINET to create an on-line database containing information about interoperable frame relay offerings. The database is expected to be operational by August. **■**

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IBM to off-load TCP/IP chores

continued from page 1

was to have it ready by the end of the year. The demo showed the off-load software running on a prototype 3172 attached to an IBM 9371 mid-range computer in Raleigh, N.C.

The off-load technology software contains a full TCP/IP stack running on top of TCP/IP for OS/2 in the 3172, which attaches LANs to mainframe channels. The current top-of-the-line 3172 Model 2 runs on a 486 Micro Channel Architecture-based platform. Part of the software will also ship in the next release of MVS (Version 2 Release 2) and may ship in VM Version 3 to redirect inbound TCP communications down to the new controller running the off-load software.

The off-load facility will require the use of one of the 3172's two channel interfaces. The box would not have to be dedicated to the off-load function, Barton said.

Michael Bowman, vice-president of marketing at Raleigh-based Netlink, Inc., a vendor of IBM connectivity products and a 3172 user, said the off-load technology will make the 3172 a more powerful and useful box.

"TCP/IP processing is an expensive use of mainframe cycles," he said. "This product will put that processing where it belongs — off the mainframe."

According to Barton, the off-load product was aimed primarily at TCP/IP users whose MVS and VM mainframes are currently at peak capacity. He also said the

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Carriers jointly unveil plans

continued from page 2

The joint announcement was intended to reassure users that the new high-speed data services will be available across the U.S. and that the carriers are working together to make sure that a common set of features are available.

However, the briefing may have raised as many questions as it answered. For example, the carriers admitted that no one has yet stepped forward to serve as a central certification agent for frame relay and SMDS equipment. Such certification would prevent equipment manufacturers from having to test equipment to make sure it works with each carrier.

The Bell officials said that the Corporation for Open Systems International (COS), which certifies Integrated Services Digital Network equipment, may fill the same role for SMDS and frame relay, but COS has not yet decided if it will assume the added duty.

It is also unclear when the interfaces necessary for full interconnection between local and long-distance carriers for frame

relay and SMDS will be ready.

Even though the briefing was intended to underscore the carriers' commitment to both frame relay and SMDS, some carriers seemed to fall short of full endorsement. For example, Southwestern Bell Corp. announced it will roll out frame relay in 11 cities in the second half of this year but made no firm commitment to offer SDMS. The carrier began a one-year SMDS trial in December and will wait until after the trial ends to announce plans for SMDS, said Bob Campbell, division manager of business market planning and product development at Southwestern Bell.

Also, GTE, which has put significant resources into both a local and long-distance trial of SMDS, declined to name any loca-



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tions where it will make frame relay available. GTE will trial frame relay in Raleigh-Durham, N.C., and "pending favorable outcome of the trial," it may offer the service in the fourth quarter of 1993, company officials said.

Nynex Corp. has already tariffed and is selling frame relay in New York. The carrier plans to file a general frame relay tariff this summer. However, it was less enthusiastic about SMDS, saying that the service "will be deployed as market conditions warrant."

Ameritech, Bell Atlantic Corp., BellSouth Corp., Pacific Telesis Group, Southern New England Telephone Co. and US West, Inc. all plan to roll out frame relay and SMDS in their major metropolitan areas during this year and next. □

Novell offers LANtern as NLM

continued from page 2

being defined by the Internet Engineering Task Force — that specifies a standard way for management systems to capture data packets traveling across a net.

Unlike other SNMP-based devices that require an SNMP agent in order to be managed by an SNMP-based system, devices supporting RMON simply capture packets. So an administrator can monitor SNMP- as well as non-SNMP-based devices and traffic between those devices.

However, the central management console has to support the RMON specification in order to receive the data captured by RMON agents.

According to Murray, the existing LANtern product includes the ability to capture packets but is designed to automatically discard those it does not recognize or need. With RMON support, LANtern will be able to capture all packets, regardless of the protocol or originating device.

An RMON upgrade will be provided to existing LANtern network monitoring devices through firmware and a new version of LANtern Services Manager, No-

vell's Windows-based monitoring console software that collects information from LANtern devices.

The RMON capabilities will also be available in the new NLM version of LANtern.

The NLMs will give customers added flexibility. For example, monitoring can be done directly through the NetWare server, from within a dedicated machine or within a machine running Runtime NetWare, which may also be running other applications — such as a database — or acting as a hub.

"This will mostly be used in conjunction with the [recently announced] hubbing capabilities," said Charles Robbins, director of communications research at Aberdeen Group, Inc., a Boston consulting firm.

Existing LANtern and LANtern Services Manager customers may add the RMON capabilities for \$750 this fall. Customers purchasing the products between now and July 31 will be upgraded at no cost. The LANtern NLM is only a technology announcement; pricing and availability have not been released yet. □

IBM to off-load TCP/IP chores

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product could be implemented without requiring changes to existing applications, as long as they contain the Sockets interface. Sockets lets Unix applications talk over TCP/IP nets.

The new capability will bring IBM more in line with competitors such as NCR Corp., which offers TCP/IP processing on its IBM-compatible front-end pro-

cessors, and McDATA Corp., which offers a communications processor that supports TCP/IP.

Management of the off-load box has not been firmed up yet, Barton said. "It will ultimately have SNMP support and could be managed by the AIX NetView/6000 platform or hooks in NetView," he added.

IBM estimated that the price of the off-load solution, which includes the 3172, will be between \$20,000 and \$30,000 when it ships. □

API to boost SNMP agent

continued from page 1

SNMP agent can communicate with multiple subagents on the same device. It consists of interface specifications, master agent source code and subagent source code.

"The standard is essentially giving the network manager a unified vs. fragmented view of agent management information," said Jeff Case, president of SNMP Research and one of the original SNMP authors.

“The common agent API is a long overdue feature for SNMP and should have been part of the original standard.”



EMANATE agents consist of a master agent that can support multiple subordinate agents, or subagents, containing proprietary, vendor-specific Management Information Base (MIB) variables. These multiple subagents are viewed by the network management device as a single agent (see graphic, this page).

For instance, an SNMP-based workstation can be equipped with a Fiber Distributed Data Interface adapter and an X.25 interface board from different vendors. In addition, the workstation typically supports multiple applications from various software vendors. Each of these elements has its own management requirements and attendant MIB extensions.

Current mechanisms for inte-

grating the proprietary MIB variables with the SNMP agent on the managed node require that the source code for each MIB be modified and recompiled.

The EMANATE interface, in contrast, allows multivendor interoperability without that complexity by providing a standard API that third-party vendors can employ to tie their MIBs to the master agent. It will support user-developed agent extensions, providing the end user with a single SNMP agent that handles the entire workstation or other devices such as hubs.

EMANATE also enables a subagent to connect or disconnect at any time, dynamically registering and unregistering its MIB variables.

"SNMP Research has identified the key enabling facility for the next generation of SNMP products," said Marshall Rose, principal of Dover Beach Consulting, Inc. in Mountain View, Calif.

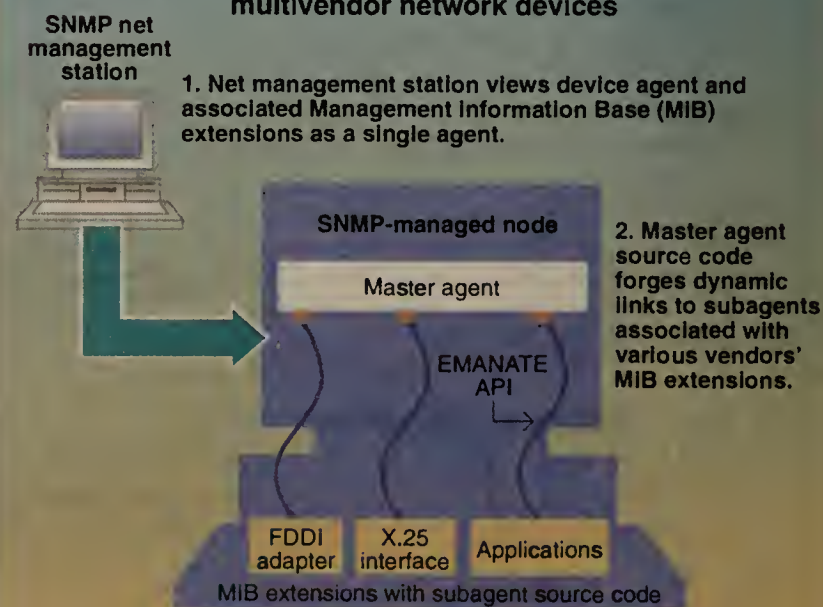
John McConnell, a vice-president at Infonetics Research, Inc. in Boulder, Colo., agreed. "The common agent API is a long overdue feature for SNMP and one that should have been part of the original standard. As more vendors incorporate it into their products, users will no longer be locked into a single vendor's management solution," he said.

EMANATE will run on any Unix, MS-DOS or OS/2 management platform. The API will initially be ported to SunConnect's SunNet Manager platform and Data General Corp.'s AViON workstations.

Other third-party vendors that have announced plans to incorporate the EMANATE API into their products include Eicon Technology Corp., Emerson Computer Power, Inc., FTP Software, Inc., Morning Star Technologies, Inc., Network Peripherals, Inc. and SynOptics. □

Extending SNMP's reach

API promises to let master agent support multivendor network devices



API = Application program interface

EMANATE = Enhanced Management Agent Through Extensions

GRAPHIC BY SUSAN SLATER

SOURCE: SNMP RESEARCH, INC., KNOXVILLE, TENN.

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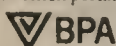
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New spec to ease SMDS mgmt.

continued from page 4

ocol-based management workstation to access an SNMP agent on a DSU to collect a variety of data about a Subscriber Network Interface (SNI), the line used to access an SMDS service. Companies can use both T-1 and T-3 SNIs.

From the SNMP workstation, users would be able to access traffic statistics — including the number of packets received and transmitted — or check a master packet count for any time period — hour, day, week or month, according to Cox.

Robust net management

A network manager could also access an on-line historical log that would list which, if any, packets were lost during transmission. This would allow the user to spot circuit degradation well before the circuit becomes unusable or is lost altogether, she said.

"This is the first big step toward giving SMDS customers robust network management information," explained William Horst, a computer specialist with the General Services Administration in Philadelphia. "We've been asking for these capabilities for more than a year now." GSA is the nation's first commercial SMDS customer.

Bellcore said the DXI-LMI of-

fers more capabilities than is already defined in an existing Bellcore Technical Reference.

Functions outlined to date are primarily designed to enable users to perform group addressing and address screening — the ability to add and drop devices from a preset list.

While efforts at the SMDSIG meeting were largely focused on approving the DXI-LMI, the focus of the group's next meeting will be on the analysis of different specifications that outline support of local-area network data over SMDS.

Elysia Tan, chairwoman of SMDSIG's technical working group and a member of Bellcore's technical staff, said her committee was happy to receive documents from Apple Computer, Inc. and Digital Equipment Corp. that specify a standard means of transporting Apple's AppleTalk and DEC's DECnet Phases IV and V over SMDS.

Neither submission, however, has been approved as a specification.

Equipment vendors that want their products to support AppleTalk or DECnet must implement the specification in their products, according to Cox.

"This shows strong support from the key vendors," she said. "SMDS is picking up steam as a [viable] transport option."

SMDSIG said it hopes other vendors will follow DEC's and Apple's lead. □

SDDN service to benefit users

continued from page 4

will be based on the carrier's SDI offering. He said SDDN-I rates will be higher than international virtual voice services.

Comparison shopping

An international SDN voice call to the U.K. costs 78 cents for the first 30 seconds and 8 cents for each additional six seconds. An SDN voice call to Japan costs \$1.87 for the first 30 seconds and about 10 cents for each additional six seconds.

By comparison, MCI Communications Corp.'s rates for Virtual Network data calls to the U.K. are \$1.38 for the first 30 seconds and 20 cents for each additional six seconds. MCI charges \$2.57 for the first 30 seconds for data calls to Japan and 24 cents for each additional six seconds.

As of June 1, Sprint Corp.'s

prices for voice and data calls to the U.K. using its Virtual Private Network service will drop to 30 cents for the first 30 seconds and 6 cents for each additional six seconds.

Prices for Japan as of July 1 will be 94 cents for the first 30 seconds and 8 cents for each additional six seconds.

AT&T also last week announced it is reducing the rates for its existing SDI international switched data service. AT&T's new rates will cut the cost of the initial 30-second calling period by as much as 28% in some countries.

For example, rates in the U.K. will fall from \$1.45 to \$1.06 for the first 30 seconds. Rates in Europe will decrease from \$1.61 to \$1.16, and rates in the Pacific Rim will drop from \$2.70 to \$1.70.

AT&T also added a new term plan for SDI that offers additional discounts of up to 15%. □

Compaq offers new Insight

continued from page 5

focus on fault management, and over time, we'll offer configuration management, performance management and security management capabilities."

Unveiled at INTEROP Spring 92 here last week, the Insight framework currently consists of two products, Server Manager/R, which Compaq already offers, and Insight Manager, which it will introduce on June 8.

Server Manager/R is a hardware/software package designed for in-depth management of remote servers. It consists of a board and a built-in modem, which reside on remote servers, and console software that lets administrators take control of those servers to monitor the status of hardware, change a configuration or perform diagnostics.

"This is good for critical server management, where you always want access to the server," said Ronnie Ward, director of product development at Compaq.

The Compaq Insight Manager is the first product in the Insight family to focus primarily on fault management. The offering is Microsoft Corp. Windows-based software that resides on the net-

work server and monitors the hardware within the server.

Insight Manager supports the Simple Network Management Protocol, enabling it to feed data to enterprise SNMP-based network management systems.

Compaq will publish its server hardware Management Information Base so that other vendors can add support for Insight. Although Insight Manager is designed to monitor Compaq's own servers, it can also be used to monitor any other server.

Company officials said Compaq is currently working with other vendors to ensure that the Insight products will work with their operating systems and management products. The first two Insight products are already compatible with Novell, Inc.'s NetWare Management System.

On a separate note, Compaq executives last week revealed some of the company's plans for expanding its hardware line.

"Our product line is not broad enough," said Gary Stimac, senior vice-president and general manager at Compaq's Systems Division. "We'll broaden it this year with a higher end product with multiprocessing capabilities. And we'll broaden the lower end with servers in the \$5,000 range." □

Platform to support SNMP, CMIP

continued from page 2

software modules called Network State Machine (NSM) that run on remote workstations and perform local polling for a central console. NSMs poll and monitor local SNMP- and CMIP-based devices on Ethernet, token-ring or Fiber Distributed Data Interface local-area networks.

The OS/EYE*NODE then polls the NSMs, as opposed to every device on the network, thereby reducing the wide-area network traffic.

Extending interoperability

According to Katherine Jones, DG's senior product marketing manager, OS/EYE*NODE will incorporate a new extensible application program interface (API) for SNMP management, developed by SNMP Research, Inc. The agent advances multivendor interoperability by enabling network administrators to easily add new management applications, enterprise Management Information Bases, proxies and third-party products to the net management platform (see "API to boost SNMP agent capabilities," page 1).

OS/EYE*NODE and its attendant NSMs use manageable code, called objects, that perform functions such as monitoring and displaying the health of a device, as

well as providing database access. Each of these functions uses an object request broker to exchange information and obtain management services from one another.

This code allows NSMs to manage existing objects on local and remote nodes and distribute functions to various devices throughout the network via the appropriate SNMP or CMIP. This obviates the need for users to write code to other vendors' APIs.

The new platform is also equipped with separate libraries for OSI-based management, SNMP-based management and database access. The database access code, for instance, will enable users to access a variety of databases.

Although an Ingres Corp. runtime database is included with the base product, the platform architecture is database neutral, meaning it can support other SQL-based databases, as well.

Finally, the new net management platform is equipped with a software distribution feature that enables net administrators to distribute software updates to multiple hosts simultaneously.

The OS/EYE*NODE is expected to be available in the fall. Pricing has not been set yet. □

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